enumext

ENUMERATE EXERCISE SHEETS

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Abstract

This package provides *"enumerated list"* environments for creating *"simple exercise sheets"* along with *"multiple choice questions"*, storing the ⟨*answers*⟩ to these in memory using `multicol` and `scontents` packages and the `l3seq` and `l3prop` modules.

Contents

Motivation and acknowledgments

Usually it is enough to use the classic `enumerate` environment to generate *"simple exercise sheets"* or *"multiple choice questions"*, the basic idea behind enumext is to cover three points:

1. To have a simple interface to be able to write *"lists of exercises"* with *"answers"*.
2. To have a simple interface for writing *"multiple choice questions"*.
3. To have a simple interface for placing *"columns"* and *"drawings"* or *"tables"*.

This package would not be possible without Phelype Oleinik who has collaborated and adapted a large part of the code and all LaTeX team for their great work and to the different members of the TeX-SX community who have provided great answers and ideas. Here a note of the main ones:

1. Answer given by Alan Munn in \topsep, \itemsep, \partopsep, \parsep - what do they each mean (and what about the bottom)?
2. Answer given by Enrico Gregorio in Understanding minipages - aligning at top
3. Answer given by Ulrich Diez in Different mechanics of hyperlink vs. hyperref
4. Answer given by Enrico Gregorio in Minipage and multicols, vertical alignment

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License and Requirements

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The enumext package loads and requires multicol[3] and scontents[4] packages, need to have a modern TeX distribution such as TeX Live or MiKTeX. It has been tested with the standard classes provided by LaTeX: book, report, article and letter on 10pt, 11pt and 12pt.

1   Introduction

In the LaTeX world world there are many useful packages and classes for creating *"lists of exercises"*, *"worksheets"* or *"multiple choice questions"*, classes like exam[1] and packages like xsim[2] do the job perfectly, but they don't always fit the basic day to day needs.

In my work (and in the work of many teachers) it is common to use *"simple exercise sheets"* also known as *"informal lists of exercises"*, as an example:

1. Factor $x^2 - 2x + 1$
2. Factor $3x + 3y + 3z$
3. True False
   (a) $\alpha > \delta$
   (b) LaTeX2e is cool?
4. Related to Linux

(a) You use linux?
(b) Usually uses the package manager?
(c) Rate the following package and class
   i.   xsim-exam
   ii. xsim
   iii. exsheets

Sometimes we are also interested in showing the *"answers"* along with the questions:

1. Factor $x^2 - 2x + 1$
   * $(x-1)^2$
2. Factor $3x + 3y + 3z$
   * $3(x + y + z)$
3. True False
   (a) $\alpha > \delta$
      * False
   (b) LaTeX2e is cool?
      * Very True!
4. Related to Linux

(a) You use linux?
   * Yes
(b) Usually uses the package manager?
   * Yes, dnf
(c) Rate the following package and class
   i.   xsim-exam
      * doesn't exist for now :(
   ii. xsim
      * very good
   iii. exsheets
      * obsolete

Or we are interested in referring to a specific question and its *"answer"*, for example:

The answer to 3.(b) is "Very True!" and the answer to 4.(c).ii is "very good".

Or we are interested in printing all the *"answers"*:

1. $(x-1)^2$ *
2. $3(x + y + z)$ *
3. (a) False   *
   (b) Very True!   *
4. (a) Yes   *

(b) Yes, dnf   *
(c) i.   doesn't exist for now :(*
   ii. very good   *
   iii. obsolete   *

Another very common thing to use in my work is *"multiple choice questions"*, for example:

1. First type of questions

   A) value   C) value
   B) correct   D) value

2. Second type of questions

   I. $2\alpha + 2\delta = 90°$
   II. $\alpha = \delta$
   III. $\angle EDF = 45°$

   A) I only   D) I and III only
   B) II only   E) I, II, and III
   C) I and II only

★ 3. Third type of questions

   (1) $2\alpha + 2\delta = 90°$
   (2) $\angle EDF = 45°$

   A) value   D) value
   B) value   E) value
   C) value

4. Question with image and label below:

A)   B)   C)

D)   E)

5. Question with image on left side:

A) value
B) value
C) value
D) correct
E) value

Where what we are interested in the ⟨*label*⟩ and a *"short note"* that we leave as an explanation, and then print them:

1. B), $x = 5$
2. D)
3. C), some note

* 4. E), A duck *
* 5. D), "other note" *
*

These *"simple worksheets"* or *"multiple choice questions"* appear to be easy to obtain using a combination of the enumerate, minipage and multicols environments, but like many things, what *"looks simple"* is not so simple.

The enumext package was created and designed to meet these small requirements in the creation of *"simple worksheets"* and *"multiple choice questions"*.

1.1 Description and usage

The enumext package defines enumerated environments using the list environment provided by LaTeX, but *"does not redefine"* any internal commands associated with it such as \list, \endlist or \item outside of the *"scope"* in which they are defined.

💣 This package is NOT intend to replace the enumerate environment nor replace the powerful enumitem[6], the approach is intended to work without hindering either of them.

This package can be used with xelatex, lualatex, pdflatex and the classical latex»dvips»ps2pdf and is present in TeX Live and MiKTeX, use the package manager to install. For manual installation, download enumext.zip and unzip it, run lualatex enumext.dtx and move all files to appropriate locations, then run mktexlsr. To produce the documentation run lualatex enumext.dtx two times.

```
enumext.sty   »   TDS:tex/latex/enumext/
enumext.pdf   »   TDS:doc/latex/enumext/
README.md     »   TDS:doc/latex/enumext/
enumext.dtx   »   TDS:source/latex/enumext/
```

The package is loaded in the usual way:

```
\usepackage{enumext}
```

1.2 The concept of left margin

There is a direct relationship between the parameters \leftmargin, \itemindent, \labelwidth and \labelsep plus an *"extra space"* that makes it difficult to obtain the desired *horizontal spaces* in a list environment.

Usually we don't want the list to go beyond the left margin of the page, but since these four values are related, that causes a problem. The enumitem[6] package adds the \labelindent parameter to solve some of these problems. A simplified representation of this in the figure 1.

Figure 1: Representation of horizontal lengths in enumitem.

The enumext package does NOT provide a user interface to set the values for \leftmargin and \itemindent, instead it provides the keys list-offset and list-indent which internally set the values for \leftmargin and \itemindent. The concepts of \leftmargin and \itemindent are different in enumext. The figure 2 shows the visual representation of idea.

Figure 2: Representation of horizontal lengths concept in enumext.

In this way we reduce a *little* the amount of parameters we have to pass. With the default values of keys list-offset, list-indent, labelwidth and labelsep the lists will have the (usually) expected output for *"simple worksheets"*. The figure 3 shows the visual representation.

Figure 3: Default horizontal lengths list-offset=0pt, list-indent=\labelwidth+\labelsep in enumext.

1.3 User interface

The user interface consists of two main list environments `enumext` (vertical) and `enumext*` (horizontal), the environment `anskey*` and the command `\anskey` to *"store content"* and the environments `keyans`, `keyans*` and `keyanspic` for multiple choice. It also provides the commands `\getkeyans` to print individual *stored content*, `\printkeyans` to print all *stored content*, `\miniright` for `minipage` and `\setenumext` to config all `[⟨key = val⟩]` options.

1.3.1 Internal counters

The package `enumext` uses internally the `enumXi`, `enumXii`, `enumXiii`, `enumXiv` counters for the four nesting levels of the `enumext` environment, the `enumXv` counter for the `keyans` environment, the `enumXvi` counter for the `keyanspic` environment, the counter `enumXvii` for `enumext*` environment and the counter `enumXviii` for `keyans*` environment.

💣 If any package defines these counters or they are user-defined in the document, the package will return a fatal error and abort the load.

1.3.2 Public dimension

The package `enumext` only provides a single public dimension `\itemwidth` and is intended for user convenience only and is not for internal use as such. The dimension `\itemwidth` is *rigid length* and contains the *"width of the content"* of each `\item` regardless of `labelwidth` and `labelsep`.

💣 If any package defines `\itemwidth` or they are user-defined `\itemwidth` in the document, the package will overwrite it without warning.

1.3.3 Support for multicol

The package provides direct support for using the `multicol`[3] package. This allows to obtain directly a two-column output as shown in the figure 4.
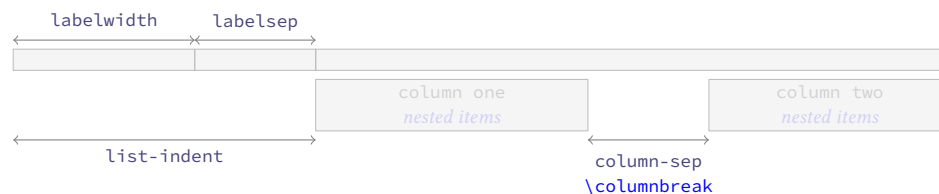

Figure 4: Representation of the two column output for a nested level in `enumext` environment.

The *"non starred"* version of the `multicols` environment is always used together with the `\raggedcolumns` command and is controlled by `columns` and `columns-sep` keys. It can be used in all nesting levels of the environment `enumext` and the environment `keyans` and can together with the `mini-env` key. If you need to force a start a new column `\columnbreak` must be used (see §4.5).

💣 The `\columnseprule` command is not available as a key and is set to *"zero"* for the inner levels and the `keyans` environment. If the value of this is set inside the document, it will affect *"all environments"* that use the `columns` key.

1.3.4 Support for `minipage`

The package provides direct support for `minipage` environment, this allows you to obtain an output like the one shown in figure 5.

Figure 5: Representation of the `mini-env` output for a nested level `enumext` environment.

The `minipage` environments on *"left side"* and *"right side"* is always used with *"aligned on top"* `[t]`. It can be used in all nesting levels of the environment `enumext` and the environment `keyans` and is controlled by `mini-env` and `mini-sep` keys. In order to switch from the *"left"* side `minipage` environment to the *"right"* side one must use the command `\miniright` (see §4.6).

1.3.5 The `\label` and `\ref` system

This package provides a user interface like the `enumitem`[6] package to customize the references which is activated by the `ref` key (§4.1), the standard LaTeX `\label` and `\ref` commands work as usual. It also provides an *"internal reference"* system for the *"stored content"* by means of the key `save-ref` (§5.1.1) when the key `save-ans` (§5.1) is active.

💣 The implementation of `\label` and `\ref` together with the `save-ref` key are compatible with the `hyperref`[8] package.

1.3.6 Support for \footnote

This package provides an internal implementation for the \footnote command which is compatible with the hyperref package for the enumext* and keyans* environments, but will not produce the expected links, and if the mini-env key is used in enumext or keyans environments the output will look like the classic way they are displayed in the environment minipage.

The best way to solve this is to use Jean-François Burnol footnotehyper[9] package, it will support keeping the links if hyperref is loaded with the hyperfootnotes=true option (default) and will show the output numbered at the bottom of the page (as opposed to how it is displayed in the minipage environment). The way to load it is as follows:

```
\usepackage{footnotehyper}
\makesavenoteenv{enumext}
\makesavenoteenv{enumext*}
```

2 The environments provided

The package enumext provides two main list environments, the *vertical* environment enumext and the *horizontal* environment enumext*.

enumext
enumext*

```
\begin{enumext}[⟨keyval list⟩]              \begin{enumext*}[⟨keyval list⟩]
  \item ⟨item content⟩                        \item ⟨item content⟩
  \item [⟨custom⟩] ⟨item content⟩             \item [⟨custom⟩] ⟨item content⟩
  \item*[⟨symbol⟩][⟨offset⟩] ⟨item content⟩   \item*[⟨symbol⟩][⟨offset⟩] ⟨item content⟩
\end{enumext}                                \end{enumext*}
```

2.1 The environment enumext

The enumext is an environment that works in the same way as the standard enumerate environment provided by LaTeX, \item and \item[⟨custom⟩] commands work in the usual way. The environment can be nested with at most *"four levels"* and the options can be configured globally using \setenumext command and locally using [⟨key = val⟩] in the environment.

Example with columns=2

1. This text is in the first level.

   (a) This text is in the second level.

      i. This text is in the third level.

A. This text is in the fourth level.

X This text is in the first level.

★ 2. This text is in the first level.

2.2 The environment enumext*

The enumext* is a *horizontal list environment* similar to the enumerate* environment provided by the enumitem package or task environment provided by the task package , \item and \item[⟨custom⟩] work as usual. The options can be configured globally using \setenumext command and locally using [⟨key = val⟩] in the environment.

Some considerations to take into account for this environment:

- The environment cannot be nested within itself or in the environment keyans*, but it can be nested within enumext and vice versa.

- Each *"item"* in the environment is placed within a minipage environment whose *width* is stored in the dimension \itemwidth that NOT includes labelwith, labelsep, only the *width of the content*.

- You cannot have floating environments like figure or table but \footnote with hyperref support is supported if the footnotehyper package is loaded.

Example with columns=2

1. This text is in the first level.

X This text is in the first level.

2. This text is in the first level.

★ 3. This text is in the first level.

2.3 The command \item*

\item*

```
\item*
\item*[⟨symbol⟩]
\item*[⟨symbol⟩][⟨offset⟩]
```

The \item*, \item*[⟨symbol⟩] and \item*[⟨symbol⟩][⟨offset⟩] works like the numbered \item, but placing a ⟨symbol⟩ to the *"left"* of the ⟨label⟩ separated from it by the ⟨offset⟩ set by the the second optional argument. The default values for ⟨symbol⟩ and ⟨offset⟩ are $\star$ '★' and the value set by labelsep key.

The *starred argument* '*' cannot be separated by spaces '␣' from the command, i.e. \item* and the first optional argument does *"not support"* verbatim content. Can be configure with the keys item-sym* and item-pos* locally in the environment or globally using \setenumext command (§3).

🔫 The behavior of `\item*` in the enumext and enumext* environments is NOT the same as in the keyans and keyans* environments.

2.3.1 Keys for `\item*`

item-sym* = {⟨*symbol*⟩}   default: *$\star$*

Sets the *symbol* to be displayed in the *"left"* of the box containing the current ⟨*label*⟩ set by labelwidth key for `\item*` in enumext and enumext*. The *symbol* can be in text or math mode, for example item-sym*={$\ast$}.

item-pos* = {⟨*rigid length*⟩}   default: *by levels*

Sets the *offset* between the box containing the current ⟨*label*⟩ defined by labelwidth key and the ⟨*symbol*⟩ set by item-sym* key. The default values are set by labelsep key at each level. If positive values are passed it will *offset to the left* and if negative values are passed it will *offset to the right*.

2.4 The command `\item` in enumext*

The `\item` command for the enumext* environment provides an optional *"first argument"* `\item`(⟨*columns*⟩) which *"joins items"* between columns. Let's consider the following examples adapted directly from the task package:

```
\begin{enumext*}[widest=10,columns=4]
  \item The first
  \item* The second
  \item The third
  \item The fourth
  \item(3)* The fifth item is way too long for this and needs three columns
  \item The sixth
  \item The seventh
  \item(2)[X] The eighth item is way too long for this and needs two columns
    (\the\itemwidth)
  \item The ninth
  \item[Z] The tenth (\the\itemwidth)
\end{enumext*}
```

1. The first   ⋆ 2. The second   3. The third   4. The fourth

⋆ 5. The fifth item is way too long for this and needs three columns   6. The sixth

7. The seventh   X   The eighth item is way too long for this and needs 8. The ninth
                          two columns (187.14374pt)

Z   The tenth (84.76483pt)

3 The command `\setenumext`

`\setenumext`

`\setenumext{`⟨*key = val*⟩`}`   `\setenumext[`⟨*keyans**⟩`]{`⟨*key = val*⟩`}`
`\setenumext[`⟨*enumext, level*⟩`]{`⟨*key = val*⟩`}`   `\setenumext[`⟨*print, level*⟩`]{`⟨*key = val*⟩`}`
`\setenumext[`⟨*enumext**⟩`]{`⟨*key = val*⟩`}`   `\setenumext[`⟨*print, **⟩`]{`⟨*key = val*⟩`}`
`\setenumext[`⟨*keyans*⟩`]{`⟨*key = val*⟩`}`   `\setenumext[`⟨*print**⟩`]{`⟨*key = val*⟩`}`

The command `\setenumext` sets the ⟨*keys*⟩ on a global basis for environments enumext, enumext*, keyans, keyans* and the `\printkeyans` command. It can be used both in the preamble and in the body of the document as many times as desired.

The ⟨*keys*⟩ set in the optional arguments of environments and commands have the *highest precedence*, overriding both options passed by `\setenumext`. If the optional argument is not passed, the first level of the environment enumext will be taken by default.

🔫 The key save-ans that activate the *"storage system"* must NOT be passed through this command and must be passed directly in the optional argument of the *"first level"* of the environment in which they are executed.

4 The keyval system

The ⟨*key = val*⟩ system used by the enumext package is implemented using l3keys so it must be taken into consideration that those keys marked as *"value forbidden"*, that is ⟨*key*⟩ is different from ⟨*key=*⟩.

All ⟨*keys*⟩ described in this section are available for the enumext, enumext*, keyans and keyans* environments with the exception of the keys series, resume, resume* which are only available for the *"first level"* of the environments enumext and enumext*; and the keys mini-right, mini-right* which are only available for the enumext* and keyans* environments.

All ⟨*keys*⟩ related to vertical or horizontal spacing accept a *"skip"* or *"dim"* expression if passed between braces, i.e. you do not need to use `\dimeval` or `\dimexpr` to perform calculations.

It should be kept in mind that using any ⟨*key*⟩ that sets a *rubber lengths* or *rigid lengths* for vertical or horizontal space on a level will influence the vertical and horizontal space for *inners levels* and keyans, keyans* and keyanspic environments.

4.1 Keys for `label` and `ref`

`label` = {⟨`\alph*` | `\Alph*` | `\arabic*` | `\roman*` | `\Roman*` ⟩}   default: *by levels*

Sets the ⟨*label*⟩ that will be printed at the *current level*. The default value for the first level of the environments `enumext` and `enumext*` are `\arabic*.`, for second level are `(\alph*)`, for third level are `\roman*.` and for fourth level are `\Alph*.`. For `keyans` and `keyans*` environments the default value is `\Alph*)`.

💣 This key is intended to give the basic structure with which the ⟨*label*⟩ will be displayed, and the form in which it is used by standard *"label and ref"* and the *"internal reference"* system with the `save-ref` key. You cannot use commands with ⟨*label*⟩ as an argument, for example `\emph{`⟨`\alph*`⟩`}` will return an error. For full customization of how ⟨*label*⟩ is displayed use the `font` or `wrap-label` keys.

`ref` = {⟨*code* `{\alph*`| `\Alph*`| `\arabic*`| `\roman*`| `\Roman*}` *more code*⟩}   default: *empty*

Modifies the way *cross references* are displayed. The `label` key sets the default form of the *cross references*, by using this key you can define a different format, for example: `ref=\emph{`⟨`\alph*`⟩`}` is valid.

Internally it renews the command associated with each counter when it is executed, i.e., in the environment `enumext` the command `\theenumXi` is modified when the key is executed at the first level, `\theenumXii` when it is executed at the second level and `\theenumXiii` together with `\theenumXiv` when it is executed at the third and fourth levels.

💣 This must be kept in mind, since the values set by the `label` and `ref` keys are not cumulative by levels, so if you have used the `ref` key in the first level and then want to associate the counter with `label` or `ref` in the second level you must use the direct commands, i.e. `\arabic{eunumXi}` to indicate the count of the first level instead of using `\theenumXi`.

`labelsep` = {⟨*rigid length*⟩}   default: `0.3333em`

Sets the *horizontal space* between the box containing the current ⟨*label*⟩ defined by `label` key and the text of an item on the first line. Internally sets the value of `\labelsep` for the current level.

`labelwidth` = {⟨*rigid length*⟩}   default: *by label*

Sets the *width* of the box containing the current ⟨*label*⟩ set by `label` key. Internally sets the value of `\labelwidth` for the current level. The default values are calculated by means of the *width* of a box by setting a *value* to the current counter using '`0`' for `\arabic*`, '`M`' for `\Alph*`, '`m`' for `\alph*`, '`VIII`' for `\Roman*` and '`viii`' for `\roman*`.

`widest` = {⟨*integer* | *string*⟩}   default: *empty*

Sets the `labelwidth` key pass the ⟨*integer*⟩ or converting the ⟨*string*⟩ of the form `\Alph`, `\alph`, `\Roman` or `\roman` to a *value* for the current counter defined by `label` key, then calculating the *width* by means of a box. For example `widest={XXIII}` or `widest={23}` are equivalent. This key is useful when the default values of the `labelwidth` key are smaller than those actually used.

`font` = {⟨*font commands*⟩}   default: *empty*

Sets the *font style* for the current ⟨*label*⟩ defined by `label` key. For example `font={\bfseries\small}`.

`align` = {⟨*left* | *right* | *center*⟩}   default: *left*

Sets the *aligned* of ⟨*label*⟩ defined by `label` key on the current level in the label box.

`wrap-label` = {⟨*code* `{#1}` *more code*⟩}   default: *empty*

Wraps the *current* ⟨*label*⟩ defined by `label` key referenced by `{#1}`. The `{`⟨*code*⟩`}` must be passed between braces. This key does not modify the value set by the `labelwidth` key and is applied only on `\item` and `\item*`. When using it in the `\setenumext` command it is necessary to use the *double hash* '`{##1}`'. For example `wrap-label={\fbox{#1}}` or you can create a command:

```
\NewDocumentCommand \labelbx { s +m }
  {%
    \IfBooleanTF{#1}
      {\strut\smash{\parbox[t]{\labelwidth}{\raggedright{#2}}}}%
      {\strut\smash{\parbox[t]{\labelwidth}{\raggedleft{#2}}}}%
  }
```

and then pass it through the key `wrap-label={\labelbx{#1}}` or `wrap-label={\labelbx*{#1}}`.

`wrap-label*` = {⟨*code* `{#1}` *more code*⟩}   default: *empty*

The same as the `wrap-label` key but also applies on `\item[`⟨*custom*⟩`]`.

4.2 Keys for spaces

`show-length` = {⟨*true* | *false*⟩}   default: *false*

Displays on the terminal the values for *all list parameters* at the current level. For *vertical spaces* show the values of `\topsep`, `\itemsep`, `\parsep` and `\partopsep`. For *horizontal spaces* show the values of `\labelwidth`, `\labelsep`, `\itemindent`, `\listparindent` and `\leftmargin`.

4.2.1   Vertical spaces

topsep = {⟨*rubber length* | *rigid length*⟩}   default: *by levels*

Set the *vertical space* added to both the top and bottom of the list. Internally sets the value of `\topsep` for the current level. The default value for the first level of the environments `enumext` and `enumext*` are `8.0pt plus 2.0pt minus 4.0pt`, for second level are `4.0pt plus 2.0pt minus 1.0pt`, for third and fourth level are `2.0pt plus 1.0pt minus 1.0pt`. For `keyans` and `keyans*` environments the default value is `4.0pt plus 2.0pt minus 1.0pt`.

parsep = {⟨*rubber length* | *rigid length*⟩}   default: *by levels*

Set the *vertical space* between paragraphs within an item. Internally sets the value of `\parsep` for the current level. The default value for the first level of the environments `enumext` and `enumext*` are `4.0pt plus 2.0pt minus 1.0pt`, for second level are `2.0pt plus 1.0pt minus 1.0pt`, for third and fourth level are `0pt`. For `keyans` and `keyans*` environments the default value is `2.0pt plus 1.0pt minus 1.0pt`.

partopsep = {⟨*rubber length* | *rigid length*⟩}   default: *by levels*

Set the *vertical space* added, beyond `topsep`, to the "top" and "bottom" of the entire environment if the environment instance is preceded by a *"blank line"* or `\par` command. Internally sets the value of `\partopsep` for the current level. The default values for first and second level in environment `enumext` are `2.0pt plus 1.0pt minus 1.0pt`, for third and fourth level are `1.0pt minus 1.0pt`. For the `keyans` environment the default value is `2.0pt plus 1.0pt minus 1.0pt`, and for the `keyans*` and `enumext*` environments it is available but *without* effect.

💣 The value of this parameter also affects the *inner levels* and the environments `keyans`, `keyanspic` and `keyans*`. Caution should be taken with *"blank lines"* or `\par` command *"before"* each environment or nested level when formatting the source code of document. TeX will enter ⟨*vertical mode*⟩ and apply this value to the "top" and "bottom" the environment or nested level.

itemsep = {⟨*rubber length* | *rigid length*⟩}   default: *by levels*

Set the *vertical space* between items, beyond the `parsep`. Internally sets the value of `\itemsep` for the current level. The default value for the first level of the environments `enumext` and `enumext*` are `4.0pt plus 2.0pt minus 1.0pt`, for the rest of the levels are `2.0pt plus 1.0pt minus 1.0pt`. For `keyans` and `keyans*` environments the default value is `4.0pt plus 2.0pt minus 1.0pt`.

noitemsep ⟨*value forbidden*⟩   default: *not used*

This is a *"meta-key"* that does not receive an argument. Set `itemsep` and `parsep` equal to `0pt` the entire level of environment.

nosep ⟨*value forbidden*⟩   default: *not used*

This is a *"meta-key"* that does not receive an argument. Sets all keys for vertical spacing equal to `0pt` the entire level of environment.

base-fix ⟨*value forbidden*⟩   default: *not used*

This is a *"meta-key"* that does not receive an argument available only for the *first level* of environment `enumext` and environment `enumext*`. Fix the *baseline* when an environment `enumext` is nested in `enumext*` or vice versa and there is no material between the `\item` and the start of the environment for example `\item \begin{enumext*}` within the environment `enumext`. Internally sets the keys `topsep`, `above` and `above*` at `0pt`.

💣 The following ⟨*keys*⟩ should be used with *"caution"*, they are intended to be used at the "top" and "bottom" of the environment when the `columns` or `mini-env` keys do not provide adequate *vertical spaces*. The values passed can be *rubber* or *rigid* lengths, the way they are applied is the way you differ, using the *star* '*' ⟨*keys*⟩ applies `\vspace*` so that LaTeX does *not discard* this space at page break.

above = {⟨*rubber length* | *rigid length*⟩}   default: *not used*

Set the *extra vertical space* added, beyond `topsep`, to the top of the entire level of environment. This key is intended to give a *"fine adjustment"* of the vertical space on the *"above"* the environment without hindering the value of the `topsep` key. The space is added with `\vspace` so is *"discardable"*.

above* = {⟨*rubber length* | *rigid length*⟩}   default: *not used*

Set the *extra vertical space* added, beyond `topsep`, to the top of the entire level of environment. This key is intended to give a *"fine adjustment"* of the vertical space on the *"above"* the environment without hindering the value of the `topsep` key. The space is added with `\vspace*` so is *"not discardable"*.

below = {⟨*rubber length* | *rigid length*⟩}   default: *not used*

Set the *extra vertical space* space added, beyond `topsep`, to the bottom of the entire level of environment. This key is intended to give a *"fine adjustment"* of the vertical space on the *"below"* the environment without hindering the value of the `topsep` key. The space is added with `\vspace` so is *"discardable"*.

below* = {⟨*rubber length* | *rigid length*⟩}   default: *not used*

Set the *extra vertical space* space added, beyond `topsep`, to the bottom of the entire level of environment. This key is intended to give a *"fine adjustment"* of the vertical space on the *"below"* the environment without hindering the value of the `topsep` key. The space is added with `\vspace*` so is *"not discardable"*.

4.2.2 Horizontal spaces

itemindent = {⟨*rigid length*⟩}   default: *0pt*

Extra *horizontal indentation*, beyond `labelsep`, of the *"first line"* off each item. This value is applied internally using `\hspace` and does not modify the value of `\itemindent`.

rightmargin = {⟨*rigid length*⟩}   default: *0pt*

Set the *horizontal space* between the right margin of the environment and the right margin of the enclosing environment, the value it takes must be greater than or equal to `0pt`. Internally sets the value of `\rightmargin` for the current level.

listparindent = {⟨*rigid length*⟩}   default: *0pt*

Sets the *horizontal space* indentation, beyond `list-indent`, for second and subsequent paragraphs within a list item. Internally sets the value of `\listparindent` for the current level.

list-offset = {⟨*rigid length*⟩}   default: *0pt*

Sets the *horizontal translation* of the entire environment level from the left edge of the box defined by the `labelwidth` key. Internally sets the values of `\leftmargin` and `\itemindent` for the current level.

list-indent = {⟨*rigid length*⟩}   default: *labelwidth + labelsep*

Sets the *indentation* of the whole environment under the box defined by `labelwidth` and `labelsep` keys. Internally sets the value of `\leftmargin` and `\itemindent` for the current level.

If `list-indent=0pt` is set in the environment `enumext` the ⟨*label*⟩ will be part of the text, separated by the value of the `labelsep` key and the *first word*, in simple terms it will look like a *"common paragraph"*. This setting is equivalent (more or less) to the `wide` key provided by the `enumitem` package.

💣 For the `enumext*` and `keyans*` environments the keys `list-indent` and `list-offset` have the same effect.

4.3 Keys for add code

💣 The following ⟨*keys*⟩ should be used with *"caution"*, they are intended to inject {⟨*code*⟩} into different parts of the defined environments. We must keep in mind that the defined environments are based on the `list` base environment provided by LaTeX which is defined (simplified) as plain form `\list`{⟨*arg one*⟩}{⟨*arg two*⟩}. Using the `before*` key does not allow access to the `list` parameters defined by [⟨*key = val*⟩].

before = {⟨*code*⟩}   default: *not used*

Execute {⟨*code*⟩} *"before"* the environment starts. The {⟨*code*⟩} must be passed between braces, is executed *"after"* performing all calculations related to the *list parameters* in the environment and the parameters sets by [⟨*key = val*⟩] that is, in the second argument of the list after setting all the parameters `\begin{list}`{⟨*arg one*⟩}{⟨*arg two*⟩{⟨*code*⟩}}.

before* = {⟨*code*⟩}   default: *not used*

Execute {⟨*code*⟩} *"before"* the environment starts. The {⟨*code*⟩} must be passed between braces, is executed *"before"* performing all calculations related to the *list parameters* and [⟨*key = val*⟩] sets in the environment that is, before the arguments defining the environment are executed: {⟨*code*⟩}`\begin{list}`{⟨*arg one*⟩}{⟨*arg two*⟩}.

first = {⟨*code*⟩}   default: *not used*

Executes {⟨*code*⟩} when *"starting"* the environment. The {⟨*code*⟩} must be passed between braces, is executed right *"after"* all *list parameters* are done, after the second argument of list, just before the first occurrence of `\item`: `\begin{list}`{⟨*arg one*⟩}{⟨*arg two*⟩}{⟨*code*⟩}`\item`.

💣 Keep in mind that the code set in this key will affect the entire *"body"* of the environment and therefore the inner levels of the list and the `keyans` environment. It is recommended to set this key per level.

after = {⟨*code*⟩}   default: *not used*

Execute {⟨*code*⟩} *"after"* finishing the environment. The {⟨*code*⟩} must be passed between braces.

4.4 Keys for start, series and resume

start = {⟨*integer* | *string*⟩}   default: *1*

Sets the *start value* of the numbering on the current level. Internally ⟨*string*⟩ is converted and passed as value to the counter defined by `label` key on the current level, i.e. it is equivalent to enter `start=5`, `start=E` or `start=v`.

start* = {⟨*integer expression*⟩}   default: *not used*

Sets the *start value* of the numbering on the current level. The {⟨*integer expression*⟩} must be passed between braces, internally is evaluated and pass to the counter defined by `label` key on the current level, i.e. it is equivalent to enter `start={\dimeval{100*\value{chapter}}` or `start={100*\value{chapter}}`.

💣 The following ⟨*keys*⟩ are *"only"* available for the `enumext*` environment and the *"first level"* of the `enumext` environment and are ignored if set when nested within each other.

series = {⟨*series name*⟩}   default: *not used*

Stores the *keys* of the optional argument of the *"first level"* of the environment in which it is executed in {⟨*series name*⟩} which is used as an argument in the key `resume`. The ⟨*keys*⟩ stored in {⟨*series name*⟩} are not cumulative and are overwritten if the same {⟨*series name*⟩} is used again.

resume = {⟨*series name*⟩}   default: *not used*

Sets the *start value* and *options* for the *"first level"* continuing the numbering of the environment in which the `series={`⟨*series name*⟩`}` key was executed. If passed *without value* this will only set *start value* continue the numbering from the last environment in which `series={`⟨*series name*⟩`}` or `resume={`⟨*series name*⟩`}` is not present and if the `save-ans` key is active it will continue the numbering from the last environment in which it was executed. The *start value* can be overwritten using `start` or `start*` keys.

resume*   ⟨*value forbidden*⟩   default: *not used*

Sets the *start value* and *options* for the *"first level"* continuing the numbering of the environment in which the `series={`⟨*series name*⟩`}` or `resume={`⟨*series name*⟩`}` keys are NOT present, if the `save-ans` key is active it will continue the numbering from the last environment in which it was executed. The *start value* can be overwritten using `start` or `start*` keys.

💣 For security reasons the `series` key will never save in {⟨*series name*⟩} the keys `series`, `resume`, `resume*`, `save-ans`, `save-key`, `start*` and `start`. When using the key `resume={`⟨*series name*⟩`}` it will have hierarchy in the ⟨*keys*⟩ that are saved in {⟨*series name*⟩}, in order to establish the value of a ⟨*key*⟩ already saved in {⟨*series name*⟩} it must be placed to the *"right"* of `resume={`⟨*series name*⟩`}`, the same thing happens with the `resume*` key, the exception is the `save-ans` key that must be placed on the *"left"* if you want to start the numbering with its value. The `resume` key passed *"without value"* must be exactly *"without value"*, i.e. `resume=` cannot be used and if executed before `resume*` it will affect the *start value*.

4.5   Keys for `multicols`

columns = {⟨*integer*⟩}   default: *1*

Set the *number of columns* to be used by the `multicols` environment within the environment. The value must be a positive integer less than or equal to `10`.

columns-sep = {⟨*rigid length*⟩}   default: *by level*

Set the *space between* columns used by the `multicols` environment within the environment. Internally sets the value of `\columnsep`, by default its value is equal to the sum of the values set in the keys `labelwidth` and `labelsep` of the current level.

💣 The `\footnote{`⟨*text*⟩`}` command in the nested levels of `multicols` will not work as expected, prefer the use of `\footnotemark[`⟨*number*⟩`]` inside the environment and `\footnotetext[`⟨*number*⟩`]{`⟨*text*⟩`}` outside the environment or via the `after` key.

4.6   Keys for `minipage`

mini-env = {⟨*rigid length*⟩}   default: *not used*

Sets the *width* of the `minipage` environment on the *"right side"*. This value added to the value set by the `mini-sep` key to determines the *width* of the `minipage` environment on the *"left side"*, taking `\linewidth` as the maximum reference value.

mini-sep = {⟨*rigid length*⟩}   default: *0.3333em*

Sets the *space between* the `minipage` environment on the *"left side"* and the `minipage` environment on the *"right side"*. This separation is applied together with `\hfill`.

4.6.1   The command `\miniright`

`\miniright`   `\begin{enumext}[mini-env=`⟨*rigid length*⟩`]` ⟨*item's before*⟩ `\item \miniright` ⟨*content*⟩ `\end{enumext}`
              `\begin{enumext}[mini-env=`⟨*rigid length*⟩`]` ⟨*item's before*⟩ `\item \miniright*`⟨*content*⟩ `\end{enumext}`

The `\miniright` command close the `minipage` environment on the *"left side"* and opens the `minipage` environment on the *"right side"* by starting it with the `\centering` command. It must be placed *"after"* the last `\item` of the current environment and *"before"* starting the material to be placed on the *"right side"*. The *starred argument* '*' inhibits the use of `\centering` command i.e. the usual LaTeX justification is maintained in the `minipage` on the *"right side"*.

💣 The `\footnote{`⟨*text*⟩`}` command in `minipage` environment will work as usual. If you prefer the footnotes to be numbered (not lowercase) and outside the environment, use `\footnotemark[`⟨*number*⟩`]` inside the environment and `\footnotetext[`⟨*number*⟩`]{`⟨*text*⟩`}` outside the environment or via the `after` key (see §1.3.6 for full support).

4.6.2   The key `mini-right`

In the horizontal list environments `enumext*` and `keyans*` it is not possible to use the `\miniright` command and the `mini-right` key must be used instead.

mini-right = {⟨*content*⟩}   default: *not used*

Set the *content* for the drawing or tabular to be placed in the `minipage` environment on the *"right side"* by starting it with `\centering`. The {⟨*content*⟩} must be passed between braces.

mini-right* = {⟨*content*⟩}   default: *not used*

Same as above, but *without* starting with `\centering`.

💣 The keys `mini-right` and `mini-right*` has a *slightly different* implementation, the argument {⟨*content*⟩} is saved in a box and then printed outside the environment using *hooks*.

5 The storage system

The entire mechanism for *"storing content"* it is activated according to `save-ans` key on the *"first level"* of `enumext` or `enumext*` environments and it is ignored if they are established when they are nested inside each other. Only when this ⟨*key*⟩ is *"active"* the `\anskey` command and the environments `anskey*`, `keyans`, `keyans*` and `keyanspic` are available.

```
\begin{enumext}[save-ans={⟨store name⟩}]        \begin{enumext}[save-ans={⟨store name⟩}]
  \item Text \anskey{answer}                      \item Text \anskey{answer}
  \item Text                                       \item Text
    \begin{keyans}                                   \begin{keyanspic}
      ...                                              ...
    \end{keyans}                                     \end{keyanspic}
\end{enumext}                                     \end{enumext}
```

By executing the key `save-ans={`⟨*store name*⟩`}` the entire structure of the environment (excluding the first level) including the optional arguments passed to the inner levels or the environment nested in it, along with the content passed to `\anskey`, the current ⟨*labels*⟩ for `\item*` and `\anspic*` in the environments `keyans`, `keyans*` and `keyanspic` will be stored in a ⟨*sequence*⟩ and at the same time will be stored (without the environment structure or optional arguments) in a ⟨*prop list*⟩.

The optional arguments of the inner levels or the nested environment are filtered by excluding all ⟨*keys*⟩ related to the *"stored system"* along with the keys `series`, `resume` and `resume*` when storing in ⟨*sequence*⟩.

5.1 Keys for storage system

🔖 The only ⟨*keys*⟩ available for all levels of the `enumext` environment and the `enumext*` environment are `no-store` and `save-key`, the rest of the ⟨*keys*⟩ described in this section must be passed directly in the optional argument of the *"first level"* of the environment in which the key `save-ans` is executed. The key `save-ans` should NOT be passed with the command `\setenumext`.

`save-ans` = {⟨*store name*⟩}   default: *not set*

Sets the *name* of the ⟨*sequence*⟩ and ⟨*prop list*⟩ in which the contents will be *"stored"* by `\anskey` and `anskey*` in `enumext` and `enumext*` environments, `\item*` in `keyans` and `keyans*` environments and `\anspic*` in `keyanspic` environment. If the ⟨*sequence*⟩ or ⟨*prop list*⟩ does not exist, it will be created globally and will not be overwritten if the key is used again.

`save-key` = {⟨*key list*⟩}   default: *not set*

This key *overrides* the default *"stored keys"* of the optional arguments of the inner levels or nested environment that will be passed to the ⟨*sequence*⟩. The ⟨*key list*⟩ passed to this key ignores any ⟨*keys*⟩ in the *"stored system"* and must be passed between braces. For example, if we execute at a second level:

```
\begin{enumext}[save-ans={⟨store name⟩}]
  \item Text \anskey{answer}
  \item Text
    \begin{enumext}[nosep, columns=2, save-key={columns=3}]
        ...
    \end{enumext}
\end{enumext}
```

The ⟨*keys*⟩ that will be stored by default in the ⟨*sequence*⟩ would be `nosep, columns=2`, but using the key `save-key={columns=3}` will overwrite this and store it in the ⟨*sequence*⟩ only the key `columns=3` ignoring all the others.

`save-sep` = {⟨*text symbol*⟩}   default: *{, }*

Sets the *text symbol* that will separate the current ⟨*label*⟩ to the *optional argument* passed to the `\item*` and `\anspic*` in the `keyans`, `keyans*` and `keyanspic` environments and storing them in the ⟨*store name*⟩ defined by the `save-ans` key. The {⟨*text symbol*⟩} must always be passed between braces, whitespace '␣' is preserved within the braces and only affects the *"stored content"* and not what is displayed when using the `show-ans` or `show-pos` keys.

5.1.1 Keys for `label` and `ref`

`save-ref` = {⟨*true* | *false*⟩}   default: *false*

Activates the *"internal label and ref"* mechanism for referencing *"stored content"* in ⟨*store name*⟩ set by `save-ans` key. To reference the location of the *"stored content"* within the environment you must use `\ref{`⟨*store name* : *position*⟩`}`, where ⟨*position*⟩ corresponds to the position occupied by the *"stored content"* in the ⟨*store name*⟩ returned by the `show-pos` key. For example `\ref{test:4}` will return `3.(b)` which corresponds to the location of the *"stored content"* at position `4` within the environment in which the key `save-ans=test` was set.

`mark-ref` = {⟨*symbol*⟩}   default: *\textasteriskcentered*

Sets the *symbol* that will be displayed by the `\printkeyans` command only if the `hyperref` package is detected and the `save-ref` key are active. This *"symbol"* is used as a *"link"* between the environment in which the `save-ans` key was used and the place where the command is executed.

5.1.2 Keys for `wrap` and `display`

`wrap-ans` = {⟨*code* {#1} *more code*⟩}   default: *\fbox+\parbox{#1}*

Wraps the *argument* passed to the `\anskey` and the *body* in `anskey*` environment referenced by {#1} when using the `show-ans` or `show-pos` keys. The {⟨*code*⟩} must be passed between braces and only affects the *argument* or *body* and NOT the *"stored content"* in the *sequence* and *prop list* {⟨*store name*⟩} set by `save-ans` key. If this key is passed using `\setenumext` it is necessary to use double '{##1}'.

`wrap-opt` = {⟨*code* {#1} *more code*⟩}   default: *[[#1]]*

Wraps the *optional argument* passed to the `\item*` and `\anspic*` referenced by {#1} in the `keyans`, `keyans*` and `keyanspic` environments when using the `show-ans` or `show-pos` keys. The {⟨*code*⟩} must be passed between braces and only affects the current *optional argument* and NOT the *"stored content"* in the *sequence* and *prop list* {⟨*store name*⟩} set by `save-ans` key. If this key is passed using `\setenumext` it is necessary to use double '{##1}'.

`show-ans` = {⟨*true* | *false*⟩}   default: *false*

Displays the *argument* passed to the `\anskey`, the *body* for `anskey*` environment, the ⟨*label*⟩ for `\item*` and `\anspic*` at the place where it is executed. If the optional argument is present in `\item*` or `\anspic*` it will be shown using `wrap-opt` key.

`mark-ans` = {⟨*symbol*⟩}   default: *\textasteriskcentered*

Sets the *symbol* to be displayed in the left margin for `\anskey`, `anskey*`, `\item*` and `\anspic*` in the place where they are executed when using the key `show-ans`.

`mark-pos` = {⟨*left* | *right*⟩}   default: *left*

Sets the *aligned* of the symbol defined by `mark-ans` key. The *"symbol"* is aligned in a box with the same dimensions of the label box defined by `labelwidth` key on the current level and separated by the value of the `labelsep` key.

5.1.3 Keys for debug and checking

`show-pos` = {⟨*true* | *false*⟩}   default: *false*

Displays the *position* occupied by the *"stored content"* by `\anskey`, `anskey*`, `\item*` and `\anspic*` in the *prop list* {⟨*store name*⟩} set by `save-ans` key. This position is used by the `\getkeyans` command and by the `\ref` command if the `save-ref` key is active.

`check-ans` = {⟨*true* | *false*⟩}   default: *false*

Enables the *checking answer* mechanism displaying an appropriate message on the terminal. This key works under the logic that each `\item` or `\item*` that does not open an inner level or nested environment contains *"only one answer"* or *"only one execution"* of the `\anskey` or `anskey*`. It is intended to be used in conjunction with the `no-store` key.

`no-store`   ⟨*value forbidden*⟩   default: *not used*

This is a *meta-key* that does not receive an argument and disables the structure stored in the *sequence* {⟨*store name*⟩} set by `save-ans` key at the entire level or a nested environment in which it runs. This key is intended for use in internal levels or nested `enumext` or `enumext*` environments in which you want to use `enumext` or `enumext*` but *"without"* using the `\anskey`, *"without"* use `anskey*`, *"without"* interfering with the `check-ans` key and *"without"* storing an unwanted structure in the *sequence* {⟨*store name*⟩}.

5.2 The command `\anskey`

`\anskey`   `\anskey`[⟨*keys*⟩]{⟨*content*⟩}

The command `\anskey` takes a mandatory non empty argument {⟨*content*⟩} and *"stores"* it in the *sequence* and *prop list* {⟨*store name*⟩} set by `save-ans` key. By design the command cannot be nested or passed *verbatim material* in the argument and it is assumed that each numbered `\item` or `\item*` within the environment in which it is active it has a *"single execution"* of `\anskey` unless `\item` or `\item*` open a nested level or use the `no-store` key.

If `save-ref` key are active and the `hyperref`[8] package is detected, `\hyperlink` and `\hypertarget` will be used, otherwise the usual *"label and ref"* system provided by LaTeX will be used.

The `\anskey` command is available for all levels of the `enumext` environment and the `enumext*` environment, but is disabled for the `keyans`, `keyans*` and `keyanspic` environments.

5.2.1 Keys for `\anskey`

By default the {⟨*content*⟩} passed to `\anskey` when *"storing"* in the *sequence* {⟨*store name*⟩} has the form `\item` ⟨*content*⟩, the following ⟨*keys*⟩ allow modifying the way in which it is *"stored"* in the *sequence*.

`break-col`   ⟨*value forbidden*⟩   default: *not used*

Stores {⟨*content*⟩} in the *sequence* {⟨*store name*⟩} of the form `\columnbreak \item` ⟨*content*⟩.

`item-join` = {⟨*columns*⟩}   default: *not set*

Set the *number of columns* to be used for `\item`(⟨*columns*⟩) and stores {⟨*content*⟩} in the *sequence* {⟨*store name*⟩} of the form `\item`(⟨*columns*⟩) ⟨*content*⟩.

`item-star`   ⟨*value forbidden*⟩   default: *not used*

Stores {⟨*content*⟩} in the *sequence* {⟨*store name*⟩} of the form `\item*` ⟨*content*⟩.

item-sym* = {⟨*symbol*⟩} default: *$\star$*

Sets the *symbol* for `\item*` when using the key `item-star` and stores {⟨*content*⟩} in the *sequence* {⟨*store name*⟩} of the form `\item*`[⟨*symbol*⟩] ⟨*content*⟩. The *symbol* can be in text or math mode, for example `item-sym*`={$`\ast`$} stores `\item*`[$`\ast`$] ⟨*content*⟩.

item-pos* = {⟨*rigid length*⟩} default: *not set*

Sets the *offset* for `\item*` when using the keys `item-star` and `item-sym*` and stores {⟨*content*⟩} in the *sequence* {⟨*store name*⟩} of the form `\item*`[⟨*symbol*⟩][⟨*offset*⟩] ⟨*content*⟩.

Example

```
\begin{enumext}[save-ans=test,show-ans=true]
  \item* Text containing our instructions or questions. \anskey{⟨first answer⟩}
  \item Text containing our instructions or questions.
    \begin{enumext}
      \item Question.\anskey{⟨second answer⟩}
    \end{enumext}
  \item Text containing our instructions or questions. \anskey{⟨third answer⟩}
  \item Text containing our instructions or questions. \anskey{⟨fourth answer⟩}
\end{enumext}
```

⋆ 1. Text containing our instructions or questions.

    * | first answer |

3. Text containing our instructions or questions.

    * | third answer |

2. Text containing our instructions or questions.

    (a) Question.

      * | second answer |

4. Text containing our instructions or questions.

    * | fourth answer |

5.3 The environment anskey*

anskey*   `\begin{anskey*}`[⟨*key = val*⟩] ⟨*body content*⟩ `\end{anskey*}`

The environment `anskey*` takes a mandatory {⟨*body content*⟩} and *"stores"* it in the *sequence* and *prop list* {⟨*store name*⟩} set by `save-ans` key. If `save-ref` key are active and the `hyperref`[8] package is detected, `\hyperlink` and `\hypertarget` will be used, otherwise the usual *"label and ref"* system provided by LATEX will be used.

By design the environment cannot be nested but full supports *"verbatim material"* in the body and it is assumed that each numbered `\item` or `\item*` within the environment in which it is active it has a *"single execution"* unless `\item` or `\item*` open a nested level or use the `no-store` key.

The `anskey*` environment is implemented using the `scontents` package, for the correct operation `\begin{anskey*}` and `\end{anskey*}` must be in different lines, all ⟨*keys*⟩ must be passed separated by commas and "without separation" of the start of the environment. Comments "*%*" or "any character" after `\begin{anskey*}` or [⟨*key = val*⟩] on the same line are NOT supported, the package `scontents` will return an "error" message if this happens. In a similar way comments "*%*" or "any character" after `\end{anskey*}` on the same line the package `scontents` will return a "warning" message.

5.3.1 Keys for anskey*

The `anskey*` environment uses the same ⟨*keys*⟩ as the `\anskey` command next to the keys inherited from package `scontents`. The environment is available for all levels of the `enumext` environment and the `enumext*` environment, but it is disabled for the `keyans`, `keyans*` and `keyanspic` environments.

write-env = {⟨*file.ext*⟩} default: *not used*

Sets the name of the ⟨*external file*⟩ in which the ⟨*contents*⟩ of the environment will be written. The ⟨*file.ext*⟩ will be created in the working directory, relative or absolute paths are not supported. If ⟨*file.ext*⟩ does not exist, it will be created or overwritten if the `overwrite` key is used.

overwrite = {⟨*true | false*⟩} default: *false*

Sets whether the ⟨*file.ext*⟩ generated by `write-env` from the `anskey*` environment will be rewritten.

force-eol = {⟨*true | false*⟩} default: *false*

Sets if the *end of line* for the ⟨*stored content*⟩ is hidden or not. This key is necessary only if the last line is the closing of some environment defined by the `fancyvrb` package as `\end{Verbatim}` or another environment that does not support a comments "*%*" after closing `\end{Verbatim}`%.

💣 For security reasons the keys `store-env`, `print-env` and `write-out` they have been left disabled. It is recommended that you review the `scontents`[4] documentation to understand how the keys described here work.

Example

```
\begin{enumext}[save-ans=test,show-pos=true,start=5]
  \item* Text containing our instructions or questions.
    \begin{anskey*}[item-star]
      ⟨first answer⟩
    \end{anskey*}
```

```
    \item Text containing our instructions or questions.
      \begin{enumext}
        \item Question.
          \begin{anskey*}
            ⟨second answer⟩
          \end{anskey*}
      \end{enumext}
    \item Text containing our instructions or questions.
      \begin{anskey*}
        ⟨third answer⟩
      \end{anskey*}
    \item Text containing our instructions or questions.
      \begin{anskey*}
        ⟨fourth answer⟩
      \end{anskey*}
\end{enumext}
```

⋆ 5. Text containing our instructions or questions.

[5] First answer with `verbatim`

6. Text containing our instructions or questions.

   (a) Question.

     [6] second answer

7. Text containing our instructions or questions.

[7] third answer

8. Text containing our instructions or questions.

[8] fourth answer

5.4 The environments keyans and keyans*

keyans   \begin{keyans}[⟨key = val⟩] \item \item[⟨custom⟩] \item* \item*[⟨content⟩] \end{keyans}

keyans*   \begin{keyans*}[⟨key = val⟩] \item \item[⟨custom⟩] \item* \item*[⟨content⟩] \end{keyans*}

The keyans and keyans* environments are *"enumerated list"* environments designed for *"multiple choice"* questions activated by the save-ans key. This environments can NOT be nested and must always be at the *"first level"* of the enumext environment, the commands \item and \item[⟨custom⟩] work in the usual and the command \item(⟨columns⟩) is available for the keyans* environment.

```
\begin{enumext}[save-ans=test]
  \item ⟨item content⟩
    \begin{keyans}[⟨key = val⟩]
      \item ⟨item content⟩
      \item [⟨custom⟩] ⟨item content⟩
      \item* ⟨item content⟩
      \item*[⟨content⟩] ⟨item content⟩
    \end{keyans}
\end{enumext}
```

```
\begin{enumext}[save-ans=test]
  \item ⟨item content⟩
    \begin{keyans*}[⟨key = val⟩]
      \item ⟨item content⟩
      \item [⟨custom⟩] ⟨item content⟩
      \item* ⟨item content⟩
      \item*[⟨content⟩] ⟨item content⟩
    \end{keyans*}
\end{enumext}
```

The ⟨keys⟩ set in the optional argument of the environment are the same (almost) as those of the enumext and enumext* environments and have higher precedence than those set by \setenumext[⟨keyans⟩]{⟨key = val⟩} or \setenumext[⟨keyans*⟩]{⟨key = val⟩}. If the optional argument is not passed or the ⟨keys⟩ are not set by \setenumext, the default values will be the same as the second level of the enumext environment with the difference in the ⟨label⟩ which will be set to label=\Alph*).

5.4.1 The \item* in keyans and keyans*

\item*   \item*
         \item*[⟨content⟩]

The \item* and \item*[⟨content⟩] command *"store"* the current ⟨label⟩ set by label key next to the ⟨content⟩ (if it is present) in *sequence* and *prop list* {⟨store name⟩} set by save-ans key in the *"first level"* of the enumext or enumext* environments.

The *starred argument* '*' cannot be separated by spaces '␣' from the command, i.e. \item* and the optional argument does *"not support"* verbatim content. By design it is assumed that the \item* will only appear *"once"* within the environment.

💣 The behavior of \item* in keyans and keyans* environments is NOT the same as in the enumext or enumext* environments.

Example

```
\begin{enumext}[save-ans=test,columns=2,show-ans=true]
  \item Text containing a question.
    \begin{keyans*}[nosep,columns=2]
      \item Choice
      \item* Correct choice
      \item Choice
      \item Choice
```

```
        \item Choice
    \end{keyans*}
  \item Text containing a question and image.
    \begin{keyans}[nosep,mini-env={0.4\linewidth}]
      \item Choice
      \item Choice
      \item Choice
      \item Choice
      \item*[⟨note⟩] Correct choice
      \miniright
      \includegraphics[scale=0.25]{example-image-a}
      Some text
    \end{keyans}
\end{enumext}
```

1. Text containing a question.
   A) Choice   * B) Correct choice
   C) Choice   D) Choice
   E) Choice

2. Text containing a question and image.
   A) Choice
   B) Choice
   C) Choice
   D) Choice
   * E) [note] Correct choice

Some text

5.5 The environment keyanspic

keyanspic \begin{keyanspic}[⟨n° above, n° below⟩]\anspic{⟨drawing⟩}\anspic*[⟨content⟩]{⟨drawing⟩}

The keyanspic is a *"fake enumerated list"* environment that which uses the \anspic command instead of \item. It is activated by the save-ans key and has the same settings as the keyans environment. It is intended for placing *"drawings"* or *"tabular"* with an in-line or *above* and *below* layout. A representation of the output can be seen in the figure 6.

Figure 6: Representation of the keyanspic environment with optional argument [3,2] in enumext.

The optional argument determines the number drawings or tabular *"above"* and *"below"* within the environment. The vertical separation between *"above"* and *"below"* is controlled by the values set by parsep and itemsep keys passed to keyans environment. If the optional argument or the second part of it is omitted the drawings or tabular will be put on a single line.

5.5.1 The command \anspic

\anspic \anspic{⟨drawing or tabular⟩}
         \anspic*[⟨content⟩]{⟨drawing or tabular⟩}

The \anspic command take three arguments, the *starred argument* '*' store the current ⟨label⟩ next to the ⟨content⟩ (if it is present) in *sequence* and *prop list* {⟨store name⟩} set by save-ans key.

The *starred argument* '*' cannot be separated by spaces '␣' from the command, i.e. \anspic* and the optional argument does *"not support"* verbatim content. By design it is assumed that the *starred argument* '*' will only appear *"once"* within the environment.

Example

```
\begin{enumext}[save-ans=test,show-ans,nosep]
  \item Question with images.
    \begin{keyanspic}[3,2]
      \anspic{\includegraphics[scale=0.15]{example-image-a}}
      \anspic{\includegraphics[scale=0.15]{example-image-b}}
      \anspic{\includegraphics[scale=0.15]{example-image-a}}
      \anspic{\includegraphics[scale=0.15]{example-image-a}}
      \anspic*[note]{\includegraphics[scale=0.15]{example-image-a}}
    \end{keyanspic}
\end{enumext}
```
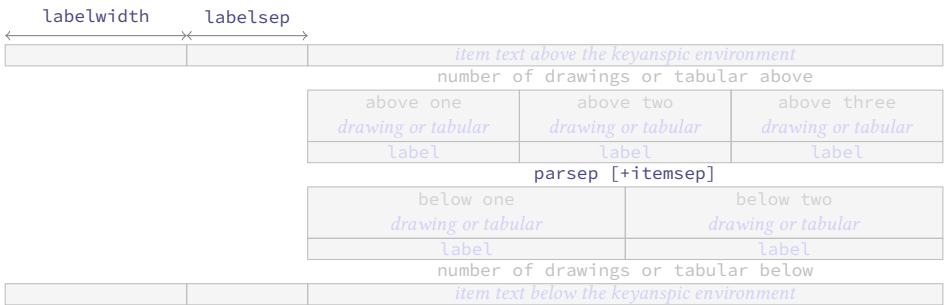
1. Question with images.

A)

B)

C)

D)

∗ E)[note]

5.6   Printing stored content

5.6.1   The command `\getkeyans`

`\getkeyans`

`\getkeyans{⟨store name : position⟩}`

The command `\getkeyans` prints the *"stored content"* in *prop list* `{⟨store name⟩}` defined by `save-ans` key in the ⟨*position*⟩ returned by the `show-pos` key. The *"stored content"* can only be accessed *after* it is stored, if `{⟨store name⟩}` does not exist the command will return an error.

The form taken by the argument `{⟨store name : position⟩}` is the same as that used to generate the *"internal label and ref"* system when `save-ref` key are active, so to refer to a *"stored content"*. For example `\getkeyans{test:4}` will return the *"stored content"* at position `4` of the environment in which the key `save-ans=test` was set.

5.6.2   The command `\printkeyans`

`\printkeyans`

`\printkeyans[⟨keys⟩]{⟨store name⟩}`
`\printkeyans*[⟨keys⟩]{⟨store name⟩}`

The command `\printkeyans` prints *"all stored content"* in *sequence* `{⟨store name⟩}` defined by `save-ans` key placing this inside the `enumext` environment or the `enumext*` environment if the *starred argument* '`*`' is used. The *"stored content"* can only be accessed *after* it is stored in the *sequence*, if `{⟨store name⟩}` does not exist the command will return an error.

The optional argument allows managing the ⟨*keys*⟩ in the *"first level"* of the environment in which the *"stored content"* of the *sequence* `{⟨store name⟩}` will be printed, if the *starred argument* '`*`' is used it will be `enumext*` otherwise `enumext`.

The default values for the *"first level"* are the same as the default values for the `enumext` and `enumext*` environments along with the keys `nosep,first=\small,font=\small` and `columns=2`. For the inner levels of the environment `enumext` saved in the *sequence* `{⟨store name⟩}` the default values are the same as those established for the second, third and fourth levels plus the keys `nosep,first=\small,font=\small`. If the environment `enumext*` is saved within the *sequence* `{⟨store name⟩}` it will have the same default values plus the keys `nosep,first=\small, font=\small`.

Since the command encapsulates by default the `enumext` environment or the `enumext*` environment, we must take some considerations:

- If we execute `\printkeyans*{⟨store name⟩}` and the *sequence* `{⟨store name⟩}` already contains any `enumext*` environment an error will be returned as we cannot nest.

- If we execute `\printkeyans*{⟨store name⟩}` and the *sequence* `{⟨store name⟩}` contains any `enumext` environments, they will start with the ⟨*keys*⟩ set for the first level unless they are set in the optional argument or `save-key` is used to modify it.

- If we execute `\printkeyans{⟨store name⟩}` and the *sequence* `{⟨store name⟩}` contains any environment `enumext*`, they will start with the ⟨*keys*⟩ set by default unless they are set in the optional argument or `save-key` is used to modify it.

The default values for the *"first level"* of `\printkeyans` commands and `\printkeyans*` are established using `\setenumext[⟨print , 1⟩]{⟨keys⟩}` and `\setenumext[⟨print*⟩]{⟨keys⟩}`. If we need to set the ⟨*keys*⟩ for the environment `enumext` *"saved"* in the *sequence* `{⟨store name⟩}` we will use `\setenumext[⟨print , level⟩]{⟨keys⟩}` and if we need to set the ⟨*keys*⟩ for the environment `enumext*` *"saved"* in the *sequence* `{⟨store name⟩}` we will use `\setenumext[⟨print , *⟩]{⟨keys⟩}`.

Example

```
\begin{enumext}[save-ans=sample,columns=2,show-pos=true,nosep,save-ref=true]
  \item Factor $3x+3y+3z$. \anskey{$3(x+y+z)$}
  \item True False

    \begin{enumext}[nosep]
      \item \LaTeX2e\ is cool? \anskey{Very True!}
    \end{enumext}
```

```
  \item Related to Linux

    \begin{enumext}[nosep]
      \item You use linux? \anskey{Yes}
      \item Rate the following package and class
        \begin{enumext}[nosep]
          \item \texttt{xsim} \anskey{very good}
          \item \texttt{exsheets} \anskey{obsolete}
        \end{enumext}
    \end{enumext}
\end{enumext}

The answer to \ref{sample:4} is \getkeyans{sample:4} and the answers to
all the worksheets are as follows:

\printkeyans{sample}
```

1. Factor $3x + 3y + 3z$.

[1] $3(x + y + z)$

2. True False
   (a) LaTeX2e is cool?
   [2] Very True!

3. Related to Linux
   (a) You use linux?

[3] Yes

(b) Rate the following package and class
   i.　xsim
   [4] very good
   ii.　exsheets
   [5] obsolete

The answer to 3.(b).i is very good and the answers to all the worksheets are as follows:

1. $3(x + y + z)$　　　　　　　　　　　　　　　　　　　　*
2. (a) Very True!　　　　　　　　　　　　　　　　　　　*
3. (a) Yes　　　　　　　　　　　　　　　　　　　　　　*
   (b) i.　very good　　　　　　　　　　　　　　　　　*
       ii.　obsolete　　　　　　　　　　　　　　　　　*

6　Full examples

Here I will leave as an example some adaptations questions taken from TeX-SX. The examples are attached to this documentation and can be extracted from your PDF viewer or from the command line by running:

```
$ pdfdetach -saveall enumext.pdf
```

and then you can use the excellent arara[1] tool to compile them.

Example 1

Adapted from the response given by Enrico Gregorio in Squares for answer choice options and perfect alignment to mathematical answers 📄.

1. La velocità di $1,00 \times 10^2$ m/s espressa in km/h è:
   A　36 km/h.
   B　360 km/h.
   C　27,8 km/h.
   D　$3,60 \times 10^8$ km/h.

3. La velocità di $1,00 \times 10^2$ m/s espressa in km/h è:
   A　36 km/h.
   B　360 km/h.
   C　27,8 km/h.
   D　$3,60 \times 10^8$ km/h.

2. In fisica nucleare si usa l'angstrom (simbolo: $1 \text{ Å} = 1 \times 10^{-10}$ m) e il fermi o femtometro ($1 \text{ fm} = 1 \times 10^{-15}$ m). Qual è la relazione tra queste due unità di misura?
   A　$1 \text{ Å} = 1 \times 10^5$ fm.
   B　$1 \text{ Å} = 1 \times 10^{-5}$ fm.
   C　$1 \text{ Å} = 1 \times 10^{-15}$ fm.
   D　$1 \text{ Å} = 1 \times 10^3$ fm.

4. In fisica nucleare si usa l'angstrom (simbolo: $1 \text{ Å} = 1 \times 10^{-10}$ m) e il fermi o femtometro ($1 \text{ fm} = 1 \times 10^{-15}$ m). Qual è la relazione tra queste due unità di misura?
   A　$1 \text{ Å} = 1 \times 10^5$ fm.
   B　$1 \text{ Å} = 1 \times 10^{-5}$ fm.
   C　$1 \text{ Å} = 1 \times 10^{-15}$ fm.
   D　$1 \text{ Å} = 1 \times 10^3$ fm.

1. B　　　　　　2. A　　　　　　3. B　　　　　　4. A

Example 2

Adapted from the response given by Florent Rougon in Multiple choice questions with proposed answers in random order — addition of automatic correction (cross mark) 📄.

1. La velocità di $1,00 \times 10^2$ m/s espressa in km/h è:

---

[1] The cool TeX automation tool: https://www.ctan.org/pkg/arara

A. 36 km/h.
✓ B. 360 km/h.
C. 27,8 km/h.
D. $3,60 \times 10^8$ km/h.

2. In fisica nucleare si usa l'angstrom (simbolo: $1\,\text{Å} = 1 \times 10^{-10}$ m) e il fermi o femtometro ($1\,\text{fm} = 1 \times 10^{-15}$ m). Qual è la relazione tra queste due unità di misura?

✓ A. $1\,\text{Å} = 1 \times 10^5$ fm.
B. $1\,\text{Å} = 1 \times 10^{-5}$ fm.
C. $1\,\text{Å} = 1 \times 10^{-15}$ fm.
D. $1\,\text{Å} = 1 \times 10^3$ fm.

3. La velocità di $1,00 \times 10^2$ m/s espressa in km/h è:

A. 36 km/h.
✓ B. 360 km/h.
C. 27,8 km/h.
D. $3,60 \times 10^8$ km/h.

4. In fisica nucleare si usa l'angstrom (simbolo: $1\,\text{Å} = 1 \times 10^{-10}$ m) e il fermi o femtometro ($1\,\text{fm} = 1 \times 10^{-15}$ m). Qual è la relazione tra queste due unità di misura?

✓ A. $1\,\text{Å} = 1 \times 10^5$ fm.
B. $1\,\text{Å} = 1 \times 10^{-5}$ fm.
C. $1\,\text{Å} = 1 \times 10^{-15}$ fm.
D. $1\,\text{Å} = 1 \times 10^3$ fm.

1. B   *
2. A   *
3. B   *
4. A   *

Example 3

A *"simple multiple choice"* test 📄.
1. First type of questions
   A value
   B correct
   C value
   D value
2. Second type of questions
   I. $2\alpha + 2\delta = 90°$
   II. $\alpha = \delta$
   III. $\angle EDF = 45°$

   A I only   D I and III only
   B II only   E I, II, and III
   C I and II only
3. Third type of questions
   (1) $2\alpha + 2\delta = 90°$
   (2) $\angle EDF = 45°$

   A value   D value
   B value   E value
   C value
4. Question with image and label below:

(A)

(B)

(C)

(D)

(E)
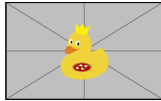
5. Question with image on left side:
   A value
   B value
   C value
   D correct
   E value

Test keys

1. B, $x = 5$
2. D
3. C, some note
* 4. E, A duck *
* 5. D, other note *
*

Example 4

A *"simple worksheet"* using ducks :) 📄.

Factor $x^2 - 2x + 1$

Factor $3x + 3y + 3z$

The following questions need to be cuaqtified :)

True False

(a) $\alpha > \delta$

(b) $\LaTeX$2e is cool?

Related to Linux

(a) You use linux?

(b) Usually uses the package manager?

(c) Rate the following package and class

    i. `xsim-exam`

    ii. `xsim`

    iii. `exsheets`

The answer to 1 is $(x - 1)^2$ and the answer to 3.(a) is False.

1. $(x - 1)^2$
2. $3(x + y + z)$
3. (a) False
   (b) Very True!
4. (a) Yes

* (b) Yes, `dnf` *
* (c) i. doesn't exist for now :(*
*   ii. very good *
*   iii. obsolete *

Example 5

Adapted from the response given by Stephen in SAT like question format 📄.

1

Which choice best describes what happens in the passage?

A) One character argues with another character who intrudes on her home.
B) One character receives a surprising request from another character.
C) One character reminisces about choices she has made over the years.
D) One character criticizes another character for pursuing an unexpected course of action.

2

Which choice best describes what happens in the passage?

A) One character argues with another character who intrudes on her home.
B) One character receives a surprising request from another character.
C) One character reminisces about choices she has made over the years.
D) One character criticizes another character for pursuing an unexpected course of action.

3

Which choice best describes what happens in the passage?

A) One character argues with another character who intrudes on her home.
B) One character receives a surprising request from another character.
C) One character reminisces about choices she has made over the years.
D) One character criticizes another character for pursuing an unexpected course of action.

4

Which choice best describes what happens in the passage?

A) One character argues with another character who intrudes on her home.
B) One character receives a surprising request from another character.
C) One character reminisces about choices she has made over the years.
D) One character criticizes another character for pursuing an unexpected course of action.

1. A)   2. C)   3. B)   4. D)

7   The way of non-enumerated lists

It is possible to use (or abuse) the `enumext` environment to mimic *non-enumerated* list environments such as `itemize` and `description`, clearly the ⟨*keys*⟩ to *"store answers"*, the `keyans` and `keyanspic` environments lose their sense and it is not the focus of the main of this package, but, why not to do it?.

Here I leave as an example other uses of the `enumext` environment that can be helpful for specific purposes. The *"trick"* to generate these *fake environments* is set `label={}` or `label={`⟨*some*⟩`}` and play with the `list-indent`, `list-offset`, `font` and `wrap-label` keys.

Fake `itemize` environment

Here we set the `label` key using the default settings in LaTeX for the four levels `\textbullet`, `\textendash`, `\textasteriskcentered` and `\textperiodcentered` together with the `nosep` key to reduce the vertical spaces in the left side example and set the `label` key in *mathematical mode* for the right side as `\ast`, `\diamond`, `\circ` and `\star` for the four levels together with the `nosep` key

- First level item
  - Second level item
    - Third level item
      · Fourth level item
- First level item

∗ First level item
  ⋄ Second level item
    ∘ Third level item
      ⋆ Fourth level item
∗ First level item

Fake `description` environment

Here we set `label={}` and `list-indent=2.5em,font=\bfseries`.

SomeThing A short one-line description.
 This is an entry *without* a label.
Something A short *one-line* description text.
Something long A much *longer* description text may take more than one line or more than one paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

If we add `list-indent=0`pt you get *widest style*:

SomeThing A short one-line description.
 This is an entry *without* a label.
Something A short *one-line* description text.
Something long A much *longer* description text may take more than one line or more than one paragraph. Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

> 🍃 The small space at the beginning of the *"unlabeled entry"* corresponds to `\labelsep` and can be removed using `\hspace{-\labelsep}` at the beginning of the line.

Description indented by label

Here we set `label={}` and we will give a convenient value to `labelsep` and `labelwidth`, for example we can take as reference our *longest label* and pass it as value using:

```
\newlength{\descitemwd}
\settowidth{\descitemwd}{\textbf{Something long}}
```

and then use `labelsep=4pt,labelwidth=\descitemwd,font=\bfseries`.

SomeThing   A short one-line description.
                    This is an entry *without* a label.
Something   A short one-line description.
Something long A much longer description. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.

The environment can be translated so that the ⟨*labels*⟩ are on the left margin calculating the value passed to the `list-offset` key, in this case it will be equal to the sum of the values set by the `labelwidth` and `labelsep` keys finally resulting as `list-offset={-\descitemwd - 4pt}`.

SomeThing   A short one-line description.
                    This is an entry *without* a label.
Something   A short one-line description.
Something long A much longer description. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.

If we add `align=right` it will look like this:

      SomeThing A short one-line description.
                    This is an entry *without* a label.
      Something A short one-line description.
Something long A much longer description. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.

> 🍃 At this point we have used `list-offset={-\descitemwd - 4pt}` instead of `list-offset={-\labelwidth - \labelsep}`, this is because the parameters `\labelwidth` and `\labelsep` take the default values, as if we had not set `label`.

Description with multi-line labels

The `label` key does not accept *multiline material*, this is where the `wrap-label*` key comes into play. Unlike the `enumitem` package, the `align` key only supports three options, so what we will do is create a command in the style `\parleft` of `enumitem` that allows us to place *multiline labels* using `\parbox`.

```
\NewDocumentCommand \labelbx { s +m }
  {%
    \IfBooleanTF{#1}
      {\strut\smash{\parbox[t]{\labelwidth}{\raggedright{#2}}}}%
      {\strut\smash{\parbox[t]{\labelwidth}{\raggedleft{#2}}}}%
  }
```

Now we just need to set `wrap-label*={\labelbx{#1}}`.

SomeThing A short one-line description.
This is an entry *without* a label.
Something A short one-line description.
Something long A much longer description. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.
Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.
SoMeThInG LoNg A much longer description. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.

Final notes

The original implementation (if you can call it that) of the ideas that led to the creation of enumext were some macros using the `enumerate`[5] package for personal use created in early 2003, the code was quite questionable, but functional for these simple requirements.

With the great answers given by Christian Hupfer in Create a fake label ref using list and the answer given by David Carlisle in Change the use of label ref by data save in an array (list) I managed to create a more solid code than the original version, now using the `l3prop`[11] and `l3seq`[11] modules together with the `hyperref`[8] and `enumitem`[6] packages, which did the job, but with some limitations.

As time went by I took these limitations as a personal challenge which I called *"reinventing the wheel"*, since there were packages and classes that did more or less what I was looking for, but did not fit my simple requirements. This *"reinventing the wheel"* finally ended up becoming enumext.

Why list environments?

The answer is simple, first I love the beauty of its syntax and many of what I had already written used the `enumerate` environment or lists created using the `enumitem` package. In my mind I thought: how complicated could it be to write a package that looked like `enumitem`? It seemed simple enough, of course I didn't have in mind the mess I was getting into working with `list` environments, `minipage` and adding support for the `multicol` and `hyperref` packages.
Of course, seeing the final result of the experiment *"reinventing the wheel"* I am quite satisfied.

Why not random questions and other utilities

The *"random"* type questions I love and hate them at the same time, although they simplify a lot the work when creating a multiple choice test, but you lose the beauty of typesetting a document with LaTeX, that is to say the output does not always look as nice as it should, even if they are only alternatives these must follow a certain order when presented either numerical or presentation, that said handling that using *nested lists* is quite complicated so I do not classify to be implemented.

8   References

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9   Change history

v1.0   2024-06-16   – First public release.

10 Index of Documentation

The italic numbers denote the pages where the corresponding entry is described.

11   Implementation

The most recent publicly released version of enumext is available at CTAN: `https://www.ctan.org/pkg/enumext`. While general feedback via email is welcomed, specific bugs or feature requests should be reported through the issue tracker: ⊕ `https://github.com/pablgonz/enumext/issues`.

💣 The documentation presented here is far from professional, it contains a lot of obvious information that to the eye of a TEXpert are superfluous, but, after so many years developing this project is the only way to remember what does what.

11.1   General conventions

Variables containing `i`, `ii`, `iii` and `iv` are associated by level with the enumext environment, variables containing `v` are associated with the keyans environment, variables containing `vi` are associated with the keyanspic environment, variables containing `vii` are associated with the enumext* environment and variables containing `viii` are associated with the keyans* environment.

To simplify writing and documentation some variables and functions that are common to the different levels of the environments are described using a capital "X".

The temporary function `\__enumext_tmp:n` is used in different parts of the package code for variable creation or execution of other functions that are grouped into this one.

All variables and functions defined in this package are private and are NOT intended to work or be used by another package or module.

11.2   Initial set up

Start the DocStrip guards.

```
1  ⟨*package⟩
```

Identify the internal prefix (LaTeX3 DocStrip convention) for l3doc class.

```
2  ⟨@@=enumext⟩
```

11.3   Declaration of the package

First we will make sure we have a minimum (super updated) version of LaTeX to work correctly.

```
3  \NeedsTeXFormat{LaTeX2e}[2024-06-01]
```

Now declare the enumext package.

```
4  \ProvidesExplPackage
5    {enumext}
6    {2024-06-16}
7    {1.0}
8    {Enumerate exercise sheets}
```

Finally check if the multicol and scontents packages are loaded, if not we load it.

```
9  \hook_gput_code:nnn {begindocument} {enumext}
10   {
11     \IfPackageLoadedTF { multicol }
12       {
13         \msg_info:nnn { enumext } { package-load } { multicol }
14       }
15       {
16         \msg_info:nnn { enumext } { package-not-load } { multicol }
17         \RequirePackage{multicol}[2024-05-23]
18       }
19     \IfPackageLoadedTF { scontents }
20       {
21         \msg_info:nnn { enumext } { package-load } { scontents }
22       }
23       {
24         \msg_info:nnn { enumext } { package-not-load } { scontents }
25         \RequirePackage{scontents}
26       }
27   }
```

11.4 Definition of variables

Variables that do not appear in this section are created by means of `\keys_define:nn` or some function described below.

`\l__enumext_level_int`
`\l__enumext_level_h_int`
`\l__enumext_anskey_level_int`
`\l__enumext_keyans_level_int`
`\l__enumext_keyans_level_h_int`
`\l__enumext_keyans_pic_level_int`

Integer variables will control the nesting levels of the environments and `\anskey` command.

```
28  \int_new:N  \l__enumext_level_int
29  \int_new:N  \l__enumext_level_h_int
30  \int_new:N  \l__enumext_anskey_level_int
31  \int_new:N  \l__enumext_keyans_level_int
32  \int_new:N  \l__enumext_keyans_level_h_int
33  \int_new:N  \l__enumext_keyans_pic_level_int
```

(*End of definition for* `\l__enumext_level_int` *and others.*)

`\l__enumext_starred_bool`
`\g__enumext_starred_bool`
`\l__enumext_starred_first_bool`
`\l__enumext_standar_bool`
`\g__enumext_standar_bool`
`\l__enumext_standar_first_bool`
`\l__enumext_anskey_env_bool`
`\l__enumext_keyans_env_bool`
`\g__enumext_start_line_tl`
`\g__enumext_envir_name_tl`
`\l__enumext_envir_name_tl`

Internal variables used by functions `\__enumext_is_not_nested:`, `\__enumext_is_on_first_-level:` and `\__enumext_keyans_name_and_start:` (§11.5.1).

```
34  \bool_new:N \l__enumext_starred_bool
35  \bool_new:N \g__enumext_starred_bool
36  \bool_new:N \l__enumext_starred_first_bool
37  \bool_new:N \l__enumext_standar_bool
38  \bool_new:N \g__enumext_standar_bool
39  \bool_new:N \l__enumext_standar_first_bool
40  \bool_new:N \l__enumext_anskey_env_bool
41  \bool_new:N \l__enumext_keyans_env_bool
42  \tl_new:N   \g__enumext_start_line_tl
43  \tl_new:N   \g__enumext_envir_name_tl
44  \tl_new:N   \l__enumext_envir_name_tl
```

(*End of definition for* `\l__enumext_starred_bool` *and others.*)

`\l__enumext_counter_i_tl`
`\l__enumext_counter_ii_tl`
`\l__enumext_counter_iii_tl`
`\l__enumext_counter_iv_tl`
`\l__enumext_counter_v_tl`
`\l__enumext_counter_vi_tl`
`\l__enumext_counter_vii_tl`
`\l__enumext_counter_viii_tl`

Variables to store the *"name of the counters"* enumXi, enumXii, enumXiii and enumXiv for enumext environment, enumXv for keyans environment and enumXvi for the keyanspic environment. The counters enumXvii and enumXviii are used by enumext* and keyans* environments.

The initial values of these variables are set by the function `\__enumext_define_counters:Nn` (§11.10) and then modified by the function `\__enumext_label_style:Nnn` used by label key (§11.13).

```
45  \cs_set_protected:Npn \__enumext_tmp:n #1
46    {
47      \tl_new:c { l__enumext_counter_#1_tl }
48    }
49  \clist_map_inline:nn { i, ii, iii, iv, v, vi, vii, viii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* `\l__enumext_counter_i_tl` *and others.*)

`\c__enumext_counter_style_tl`
`\l__enumext_ref_key_arg_tl`
`\l__enumext_ref_the_count_tl`
`\l__enumext_the_counter_X_tl`
`\l__enumext_renew_the_count_X_tl`

Internal variables used by ref key (§11.13).

```
50  \tl_const:Nn \c__enumext_counter_style_tl
51    { { arabic } { roman } { Roman } { alph } { Alph } }
52  \tl_new:N \l__enumext_ref_key_arg_tl
53  \tl_new:N \l__enumext_ref_the_count_tl
54  \cs_set_protected:Npn \__enumext_tmp:n #1
55    {
56      \tl_new:c  { l__enumext_renew_the_count_#1_tl }
57      \tl_new:c  { l__enumext_the_counter_#1_tl }
58      \tl_set:ce { l__enumext_the_counter_#1_tl } { \exp_not:c { theenumX#1 } }
59    }
60  \clist_map_inline:nn { i, ii, iii, iv, v, vi, vii, viii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* `\c__enumext_counter_style_tl` *and others.*)

`\g__enumext_resume_int`
`\g__enumext_resume_vii_int`
`\l__enumext_resume_name_tl`
`\l__enumext_resume_active_bool`
`\g__enumext_starred_series_tl`
`\g__enumext_standar_series_tl`

Internal variables used by resume, resume* and series keys (§11.24).

```
61  \int_new:N  \g__enumext_resume_int
62  \int_new:N  \g__enumext_resume_vii_int
63  \tl_new:N   \l__enumext_resume_name_tl
64  \bool_new:N \l__enumext_resume_active_bool
65  \tl_new:N   \g__enumext_standar_series_tl
66  \tl_new:N   \g__enumext_starred_series_tl
```

(*End of definition for* `\g__enumext_resume_int` *and others.*)

`\l__enumext_current_widest_dim`
`\g__enumext_counter_styles_tl`
`\g__enumext_widest_label_tl`
`\l__enumext_label_width_by_box`

The variable `\l__enumext_current_widest_dim` stores the current label width, the variable `\g__enumext_counter_styles_tl` stores the default ⟨*label style*⟩ and the variable `\g__enumext_widest_label_tl` the label width. These variables are used by widest (§11.14) and label (§11.12) keys.

```
67 \dim_new:N \l__enumext_current_widest_dim
68 \tl_new:N  \g__enumext_counter_styles_tl
69 \tl_new:N  \g__enumext_widest_label_tl
70 \box_new:N \l__enumext_label_width_by_box
```

(*End of definition for* `\l__enumext_current_widest_dim` *and others.*)

`\l__enumext_leftmargin_tmp_X_bool`
`\l__enumext_leftmargin_tmp_X_dim`
`\l__enumext_leftmargin_X_dim`
`\l__enumext_itemindent_X_dim`

The boolean variable `\l__enumext_leftmargin_tmp_X_bool` and the dimensional variable `\l__enumext_leftmargin_tmp_X_dim` are used by the list-indent key (§11.17). The variables `\l__enumext_leftmargin_X_dim` and `\l__enumext_itemindent_X_dim` are used and set by the function `\__enumext_calc_hspace:NNNNNNNNNNNN` (§11.37.1).

```
71 \cs_set_protected:Npn \__enumext_tmp:n #1
72   {
73     \bool_new:c { l__enumext_leftmargin_tmp_#1_bool }
74     \dim_new:c  { l__enumext_leftmargin_tmp_#1_dim }
75     \dim_new:c  { l__enumext_leftmargin_#1_dim      }
76     \dim_new:c  { l__enumext_itemindent_#1_dim      }
77   }
78 \clist_map_inline:nn { i, ii, iii, iv, v, vi, vii, viii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* `\l__enumext_leftmargin_tmp_X_bool` *and others.*)

`\l__enumext_multicols_above_X_skip`
`\l__enumext_multicols_below_X_skip`

Internal variables used by columns key §11.21).

```
79 \cs_set_protected:Npn \__enumext_tmp:n #1
80   {
81     \skip_new:c  { l__enumext_multicols_above_#1_skip }
82     \skip_new:c  { l__enumext_multicols_below_#1_skip }
83   }
84 \clist_map_inline:nn { i, ii, iii, iv, v } { \__enumext_tmp:n {#1} }
```

(*End of definition for* `\l__enumext_multicols_above_X_skip` *and* `\l__enumext_multicols_below_X_skip`*.*)

`\g__enumext_minipage_stat_int`
`\l__enumext_minipage_left_skip`
`\l__enumext_minipage_right_skip`
`\l__enumext_minipage_after_skip`
`\g__enumext_minipage_right_skip`
`\g__enumext_minipage_after_skip`
`\l__enumext_minipage_left_X_dim`
`\l__enumext_minipage_active_X_bool`

Internal variables used by `\miniright` command (§11.22.4) and the keys mini-right, mini-right*, mini-env and mini-sep (§11.20, §11.22).

```
85 \int_new:N  \g__enumext_minipage_stat_int
86 \skip_new:N \l__enumext_minipage_left_skip
87 \skip_new:N \l__enumext_minipage_right_skip
88 \skip_new:N \l__enumext_minipage_after_skip
89 \skip_new:N \g__enumext_minipage_right_skip
90 \skip_new:N \g__enumext_minipage_after_skip
91 \cs_set_protected:Npn \__enumext_tmp:n #1
92   {
93     \dim_new:c  { l__enumext_minipage_left_#1_dim      }
94     \bool_new:c { l__enumext_minipage_active_#1_bool }
95   }
96 \clist_map_inline:nn { i, ii, iii, iv, v, vii, viii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* `\g__enumext_minipage_stat_int` *and others.*)

`\l__enumext_wrap_label_X_bool`
`\l__enumext_wrap_label_opt_X_bool`
`\l__enumext_start_X_int`
`\l__enumext_fake_item_indent_X_tl`
`\l__enumext_label_fill_left_X_tl`
`\l__enumext_label_fill_right_X_tl`
`\l__enumext_vspace_a_star_X_bool`
`\l__enumext_vspace_b_star_X_bool`

The bool vars `\l__enumext_wrap_label_X_bool` and `\l__enumext_wrap_label_opt_X_bool` are used by wrap-label and wrap-label* keys (§11.12), the integer `\l__enumext_start_X_int` are used by the start and start* keys (§11.14), the token list `\l__enumext_fake_item_indent_X_tl` is used by itemindent key (§11.17.1), the variables `\l__enumext_label_fill_left_X_tl` and `\l__enumext_label_fill_left_X_tl` are used by the align key (§11.12). The boolean vars `\l__enumext_vspace_a_star_X_bool`, `\l__enumext_vspace_b_star_X_bool` are used by above, above*, below and below* keys (§11.19).

```
97  \cs_set_protected:Npn \__enumext_tmp:n #1
98    {
99      \bool_new:c { l__enumext_wrap_label_#1_bool      }
100     \bool_new:c { l__enumext_wrap_label_opt_#1_bool }
101     \int_new:c  { l__enumext_start_#1_int            }
102     \tl_new:c   { l__enumext_fake_item_indent_#1_tl }
103     \tl_new:c   { l__enumext_label_fill_left_#1_tl  }
104     \tl_new:c   { l__enumext_label_fill_right_#1_tl }
105     \bool_new:c { l__enumext_vspace_a_star_#1_bool  }
106     \bool_new:c { l__enumext_vspace_b_star_#1_bool  }
107   }
108 \clist_map_inline:nn { i, ii, iii, iv, v, vii, viii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* \l__enumext_wrap_label_X_bool *and others.*)

\l__enumext_store_active_bool
\l__enumext_store_name_tl
\g__enumext_store_name_tl
\l__enumext_store_anskey_arg_tl
\l__enumext_store_anskey_env_tl
\l__enumext_store_anskey_opt_tl
\l__enumext_store_current_label_tl
\l__enumext_store_current_opt_arg_tl
\l__enumext_store_current_label_tmp_tl

The variable \l__enumext_store_active_bool setting by save-ans key (§11.25.1) activates all the mechanism related to \anskey, anskey*, keyans, keyans* and keyanspic environments.

The variable \l__enumext_store_name_tl saves the {⟨*store name*⟩} set by the save-ans key of the *sequence* and *prop list* in which we will store, the variable \g__enumext_store_name_tl it's just a global copy of {⟨*store name*⟩} used by different functions.

The variable \l__enumext_store_anskey_arg_tl save the *argument* of \anskey (§11.29) and the variables \l__enumext_store_anskey_env_tl and \l__enumext_store_anskey_opt_tl save the ⟨*body*⟩ and the ⟨*keys*⟩ of the environment anskey* (§11.30).

The variables \l__enumext_store_current_label_tl and \l__enumext_store_current_opt_-arg_tl save the *current label* and *optional argument* of \item* (§11.36) and \anspic* (§11.40.1) for the keyans, keyans* and keyanspic environments.

The variable \l__enumext_store_current_label_tmp_tl is a temporary variable used by keyans, keyans* and keyanspic at various points.

```
109 \bool_new:N \l__enumext_store_active_bool
110 \tl_new:N   \l__enumext_store_name_tl
111 \tl_new:N   \g__enumext_store_name_tl
112 \tl_new:N   \l__enumext_store_anskey_arg_tl
113 \tl_new:N   \l__enumext_store_anskey_env_tl
114 \tl_new:N   \l__enumext_store_anskey_opt_tl
115 \tl_new:N   \l__enumext_store_current_label_tl
116 \tl_new:N   \l__enumext_store_current_opt_arg_tl
117 \tl_new:N   \l__enumext_store_current_label_tmp_tl
```

(*End of definition for* \l__enumext_store_active_bool *and others.*)

\l__enumext_setkey_tmpa_tl
\l__enumext_setkey_tmpb_tl
\l__enumext_setkey_tmpa_int
\l__enumext_setkey_tmpa_seq
\l__enumext_setkey_tmpb_seq

Internal variables used by the command \setenumext (§11.47).

```
118 \tl_new:N  \l__enumext_setkey_tmpa_tl
119 \tl_new:N  \l__enumext_setkey_tmpb_tl
120 \int_new:N \l__enumext_setkey_tmpa_int
121 \seq_new:N \l__enumext_setkey_tmpa_seq
122 \seq_new:N \l__enumext_setkey_tmpb_seq
```

(*End of definition for* \l__enumext_setkey_tmpa_tl *and others.*)

\l__enumext_print_keyans_starred_tl
\l__enumext_mark_position_str
\g__enumext_item_symbol_aux_tl
\l__enumext_print_keyans_X_tl
\l__enumext_store_save_key_X_tl
\l__enumext_store_save_key_X_bool
\l__enumext_store_upper_level_X_bool

Internal variables used by command \printkeyans (§11.46), show-pos key (§11.26), item-sym* key (§11.34), save-key key (§11.26.2) and *"storage level system"*.

```
123 \tl_new:N  \l__enumext_print_keyans_starred_tl
124 \str_new:N \l__enumext_mark_position_str
125 \tl_new:N  \g__enumext_item_symbol_aux_tl
126 \cs_set_protected:Npn \__enumext_tmp:n #1
127   {
128     \tl_new:c   { l__enumext_print_keyans_#1_tl        }
129     \tl_new:c   { l__enumext_store_save_key_#1_tl       }
130     \bool_new:c { l__enumext_store_save_key_#1_bool     }
131     \bool_new:c { l__enumext_store_upper_level_#1_bool }
132   }
133 \clist_map_inline:nn { i, ii, iii, iv, vii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* \l__enumext_print_keyans_starred_tl *and others.*)

\l__enumext_keyans_pic_body_seq
\l__enumext_keyans_pic_width_dim
\l__enumext_keyans_pic_above_int
\l__enumext_keyans_pic_below_int
\l__enumext_keyans_pic_above_skip

Internal variables used by keyanspic environment (§11.40.2).

```
134 \seq_new:N  \l__enumext_keyans_pic_body_seq
135 \dim_new:N  \l__enumext_keyans_pic_width_dim
136 \int_new:N  \l__enumext_keyans_pic_above_int
137 \int_new:N  \l__enumext_keyans_pic_below_int
138 \skip_new:N \l__enumext_keyans_pic_above_skip
```

(*End of definition for* \l__enumext_keyans_pic_body_seq *and others.*)

\l__enumext_check_answers_bool
\g__enumext_check_ans_key_bool
\l__enumext_check_start_line_env_tl
\g__enumext_check_starred_cmd_int
\g__enumext_item_anskey_int
\g__enumext_item_number_int
\g__enumext_item_number_bool
\g__enumext_item_answer_diff_int

Internal variables used by *"internal check answer"* mechanism (§11.25.3) used by the check-ans and no-store keys and check for starred commands \item* in keyans and keyans* environments and \anspic* in keyanspic environment.

```
139 \bool_new:N \l__enumext_check_answers_bool
140 \bool_new:N \g__enumext_check_ans_key_bool
141 \tl_new:N   \l__enumext_check_start_line_env_tl
142 \int_new:N  \g__enumext_check_starred_cmd_int
143 \int_new:N  \g__enumext_item_anskey_int
```

```
144  \int_new:N  \g__enumext_item_number_int
145  \bool_new:N \l__enumext_item_number_bool
146  \int_new:N  \g__enumext_item_answer_diff_int
```

(*End of definition for* \l__enumext_check_answers_bool *and others.*)

\l__enumext_hyperref_bool
\l__enumext_footnotes_key_bool

The boolean variable \l__enumext_hyperref_bool will determine if the hyperref package is present or load in memory (§11.8). The boolean variable \l__enumext_footnotes_key_bool determine if hyperref is load with key hyperfootnotes=true.

```
147  \bool_new:N \l__enumext_hyperref_bool
148  \bool_new:N \l__enumext_footnotes_key_bool
```

(*End of definition for* \l__enumext_hyperref_bool *and* \l__enumext_footnotes_key_bool.)

\l__enumext_newlabel_arg_one_tl
\l__enumext_newlabel_arg_two_tl
\l__enumext_write_aux_file_tl
\l__enumext_label_copy_X_tl

Internal variables used by save-ref key (§11.26). The variables \l__enumext_label_copy_X_tl correspond to temporary copies of the ⟨*labels*⟩ defined by level on which operations will be performed.

The variables \l__enumext_newlabel_arg_one_tl and \l__enumext_newlabel_arg_two_tl will be used to form the arguments passed to the function __enumext_newlabel:nn (§11.8) and the variable \l__enumext_write_aux_file_tl will be in charge of executing the writing code in the .aux file.

```
149  \tl_new:N \l__enumext_newlabel_arg_one_tl
150  \tl_new:N \l__enumext_newlabel_arg_two_tl
151  \tl_new:N \l__enumext_write_aux_file_tl
152  \cs_set_protected:Npn \__enumext_tmp:n #1
153    {
154       \tl_new:c { l__enumext_label_copy_#1_tl }
155    }
156  \clist_map_inline:nn { i, ii, iii, iv, v, vi, vii, viii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* \l__enumext_newlabel_arg_one_tl *and others.*)

\g__enumext_footnote_int
\g__enumext_footnote_arg_seq
\g__enumext_footnote_int_seq

Internal variables used for redefinition of \footnote (§11.42).

```
157  \int_new:N \g__enumext_footnote_int
158  \seq_new:N \g__enumext_footnote_arg_seq
159  \seq_new:N \g__enumext_footnote_int_seq
```

(*End of definition for* \g__enumext_footnote_int, \g__enumext_footnote_arg_seq, *and* \g__enumext_footnote_int_seq.)

\l__enumext_item_starred_X_bool
l__enumext_item_column_pos_X_int
\g__enumext_item_count_all_X_int
\l__enumext_joined_item_X_int
\l__enumext_joined_item_aux_X_int
\l__enumext_tmpa_X_int
\l__enumext_tmpa_X_dim
\l__enumext_item_text_X_box
\l__enumext_joined_width_X_dim
\l__enumext_item_width_X_dim
\g__enumext_item_symbol_aux_X_tl
\l__enumext_align_label_X_str
\g__enumext_minipage_active_X_bool
\l__enumext_miniright_code_X_box
\g__enumext_minipage_center_X_bool
\g__enumext_minipage_right_X_dim
\g__enumext_minipage_right_X_skip

Internal variables used by enumext* and keyans* environments.

```
160  \cs_set_protected:Npn \__enumext_tmp:n #1
161    {
162       \bool_new:c { l__enumext_item_starred_#1_bool    }
163       \int_new:c  { l__enumext_item_column_pos_#1_int  }
164       \int_new:c  { g__enumext_item_count_all_#1_int   }
165       \int_new:c  { l__enumext_joined_item_#1_int      }
166       \int_new:c  { l__enumext_joined_item_aux_#1_int  }
167       \int_new:c  { l__enumext_tmpa_#1_int             }
168       \dim_new:c  { l__enumext_tmpa_#1_dim             }
169       \box_new:c  { l__enumext_item_text_#1_box        }
170       \dim_new:c  { l__enumext_joined_width_#1_dim     }
171       \dim_new:c  { l__enumext_item_width_#1_dim       }
172       \tl_new:c   { g__enumext_item_symbol_aux_#1_tl   }
173       \str_new:c  { l__enumext_align_label_#1_str      }
174       \bool_new:c { g__enumext_minipage_active_#1_bool }
175       \box_new:c  { l__enumext_miniright_code_#1_box   }
176       \bool_new:c { g__enumext_minipage_center_#1_bool }
177       \dim_new:c  { g__enumext_minipage_right_#1_dim   }
178       \skip_new:c { g__enumext_minipage_right_#1_skip  }
179    }
180  \clist_map_inline:nn { vii, viii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* \l__enumext_item_starred_X_bool *and others.*)

\c__enumext_all_envs_clist

An internal clist-var variable to run with __enumext_tmp:n.

```
181  \clist_const:Nn \c__enumext_all_envs_clist
182    {
183       {level-1}{i}, {level-2}{ii}, {level-3}{iii}, {level-4}{iv},
184       {keyans}{v}, {enumext*}{vii}, {keyans*}{viii}
185    }
```

(*End of definition for* \c__enumext_all_envs_clist.)

11.5   Some utility functions

\keys_precompile:neN

Non-standard kernel variant used by the \printkeyans command (§11.46).

```
186  \cs_generate_variant:Nn \keys_precompile:nnN { neN }
```

(*End of definition for* \keys_precompile:neN.)

__enumext_at_begin_document:n

A internal *"hook"* function used for copying plain list and minipage environments definition and hyperref detection.

```
187  \cs_new_protected:Npn \__enumext_at_begin_document:n #1
188    {
189      \hook_gput_code:nnn {begindocument} {enumext} { #1 }
190    }
```

(*End of definition for* __enumext_at_begin_document:n.)

__enumext_after_env:nn
__enumext_before_env:nn

A internal *"hook"* functions for execute code mini-right and mini-right* keys outside the enumext* and keyans* environments and print check-ans outside the enumext and enumext* environments.

```
191  \cs_new_protected:Npn \__enumext_after_env:nn #1 #2
192    {
193      \hook_gput_code:nnn {env/#1/after} {enumext} {#2}
194    }
195  \cs_new_protected:Npn \__enumext_before_env:nn #1 #2
196    {
197      \hook_gput_code:nnn {env/#1/before} {enumext} {#2}
198    }
```

(*End of definition for* __enumext_after_env:nn *and* __enumext_before_env:nn.)

__enumext_level:

Function for check current level in enumext.

```
199  \cs_new:Nn \__enumext_level:
200    {
201      \int_to_roman:n { \l__enumext_level_int }
202    }
```

(*End of definition for* __enumext_level:.)

__enumext_if_is_int:nT
__enumext_if_is_int:nF
__enumext_if_is_int:nTF

A conditional function to know if the variable we are passing is an integer used by start and widest keys. This function is taken directly from the answer given by Henri Menke in How to test if an expl3 function argument is an integer expression?.

```
203  \prg_new_protected_conditional:Npnn \__enumext_if_is_int:n #1 { T, F, TF }
204    {
205      \regex_match:nnTF { ^[\+\-]?[\d]+$ } {#1} % $
206        { \prg_return_true: }
207        { \prg_return_false: }
208    }
```

(*End of definition for* __enumext_if_is_int:nT, __enumext_if_is_int:nF, *and* __enumext_if_is_int:nTF.)

__enumext_regex_counter_style:

The internal function __enumext_regex_counter_style: replace the '*' with the actual counter of the running level and is used by the ref key. It loops through the defined counter styles in \c__enumext_-counter_style_tl and replace '*' by real command, for example, looking for \arabic* and replacing that by \arabic{⟨*counter*⟩} defined on the current level.

```
209  \cs_new_protected:Nn \__enumext_regex_counter_style:
210    {
211      \tl_map_inline:Nn \c__enumext_counter_style_tl
212        {
213          \regex_replace_once:nnN { \c{##1}\* }
214            { \c{##1}\cB{\u{l__enumext_ref_the_count_tl}\cE} } \l__enumext_ref_key_arg_tl
215        }
216    }
```

(*End of definition for* __enumext_regex_counter_style:.)

__enumext_show_length:nnn

Internal function used by show-length key to show *"all lengths"* calculated and use in enumext, enumext*, keyans and keyans* environments.

```
217  \cs_new:Npn \__enumext_show_length:nnn #1 #2 #3
218    {
219      * ~ #2
220      \prg_replicate:nn { 14 - \str_count:n {#2} } { ~ }
221        = ~ \use:c { #1_use:c } { l__enumext_#2_#3_#1 } \\
222    }
```

(*End of definition for* __enumext_show_length:nnn.)

11.5.1   Utilities for environments and levels

__enumext_is_not_nested:
__enumext_is_on_first_level:

The function `\__enumext_is_not_nested:` set the variables `\g__enumext_standar_bool` and `\g__enumext_starred_bool` to *"true"* only if the environments enumext and enumext* are nested in each other and save the environment name in `\l__enumext_envir_name_tl`.

```
223  \cs_new_protected:Nn \__enumext_is_not_nested:
224    {
225      \str_case:en { \@currenvir }
226        {
227          {enumext}
228            {
229              \tl_set:Nn \l__enumext_envir_name_tl { enumext }
230              \bool_lazy_and:nnT
231                { \bool_not_p:n { \g__enumext_standar_bool } }
232                { \int_compare_p:nNn { \l__enumext_level_h_int } = { 0 } }
233                {
234                  \bool_gset_true:N \g__enumext_standar_bool
235                }
236            }
237          {enumext*}
238            {
239              \tl_set:Nn \l__enumext_envir_name_tl { enumext* }
240              \bool_lazy_and:nnT
241                { \bool_not_p:n { \g__enumext_starred_bool } }
242                { \int_compare_p:nNn { \l__enumext_level_int } = { 0 } }
243                {
244                  \bool_gset_true:N \g__enumext_starred_bool
245                }
246            }
247        }
248    }
```

The function `\__enumext_is_on_first_level:` will set the variables `\l__enumext_standar_-first_bool` (§11.25.1), `\l__enumext_starred_first_bool` (§11.25.1) and `\l__enumext_anskey_-env_bool` (§11.30) to *"true"* only if the environment is not nested and we are in the *"first level"* of it . We will also save the *start line number* of each environment in the variable `\g__enumext_start_line_tl` and the *name* of each environment in the variable `\g__enumext_envir_name_tl` to use in messages related to the check-ans key and `.log` file.

```
249  \cs_new_protected:Nn \__enumext_is_on_first_level:
250    {
251      \bool_lazy_all:nT
252        {
253          { \bool_if_p:N \g__enumext_standar_bool }
254          { \int_compare_p:nNn { \l__enumext_level_int } = { 1 } }
255          { \int_compare_p:nNn { \l__enumext_level_h_int } = { 0 } }
256        }
257        {
258          \bool_set_true:N \l__enumext_standar_first_bool
259          \bool_set_true:N \l__enumext_anskey_env_bool
260          \tl_gset:Nn \g__enumext_envir_name_tl { enumext }
261          \tl_gset:Ne \g__enumext_start_line_tl
262            {
263              on ~ line ~ \exp_not:V \inputlineno
264            }
265        }
266      \bool_lazy_all:nT
267        {
268          { \bool_if_p:N \g__enumext_starred_bool }
269          { \int_compare_p:nNn { \l__enumext_level_h_int } = { 1 } }
270          { \int_compare_p:nNn { \l__enumext_level_int } = { 0 } }
271        }
272        {
273          \bool_set_true:N \l__enumext_starred_first_bool
274          \bool_set_true:N \l__enumext_anskey_env_bool
275          \tl_gset:Nn \g__enumext_envir_name_tl { enumext* }
276          \tl_gset:Ne \g__enumext_start_line_tl
277            {
278              on ~ line ~ \exp_not:V \inputlineno
279            }
280        }
281    }
```

(*End of definition for* __enumext_is_not_nested: *and* __enumext_is_on_first_level:.)

__enumext_keyans_name_and_start:

The function __enumext_keyans_name_and_start: will save the start line number and name of the environments keyans, keyans* and keyanspic in the variables \l__enumext_check_start_-line_env_tl and \l__enumext_envir_name_tl to use in the __enumext_check_starred_cmd:n function.

```
282 \cs_new_protected:Nn \__enumext_keyans_name_and_start:
283   {
284     \str_case:en { \@currenvir }
285       {
286         {keyans}
287           {
288             \tl_set:Nn \l__enumext_envir_name_tl { keyans }
289             \tl_set:Ne \l__enumext_check_start_line_env_tl
290               {
291                 in ~ 'keyans' ~ start ~ on ~ line ~ \exp_not:V \inputlineno
292               }
293           }
294         {keyans*}
295           {
296             \tl_set:Nn \l__enumext_envir_name_tl { keyans* }
297             \tl_set:Ne \l__enumext_check_start_line_env_tl
298               {
299                 in ~ 'keyans*' ~ start ~ on ~ line ~ \exp_not:V \inputlineno
300               }
301           }
302         {keyanspic}
303           {
304             \tl_set:Nn \l__enumext_envir_name_tl { keyanspic }
305             \tl_set:Ne \l__enumext_check_start_line_env_tl
306               {
307                 in ~ 'keyanspic' ~ start ~ on ~ line ~ \exp_not:V \inputlineno
308               }
309           }
310       }
311   }
```

(*End of definition for* __enumext_keyans_name_and_start:.)

11.5.2   Utilities for log and terminal

__enumext_reset_global_vars:
__enumext_reset_global_int:
__enumext_reset_global_bool:
__enumext_reset_global_tl:

The function __enumext_reset_global_vars: will be passed to the function __enumext_execute_-after_env: and will return the global variables to their default values after being used.

```
312 \cs_new_protected:Nn \__enumext_reset_global_vars:
313   {
314     \__enumext_reset_global_int:
315     \__enumext_reset_global_bool:
316     \__enumext_reset_global_tl:
317   }
318 \cs_new_protected:Nn \__enumext_reset_global_int:
319   {
320     \int_gzero:N \g__enumext_item_number_int
321     \int_gzero:N \g__enumext_item_anskey_int
322     \int_gzero:N \g__enumext_item_answer_diff_int
323   }
324 \cs_new_protected:Nn \__enumext_reset_global_bool:
325   {
326     \bool_gset_false:N \g__enumext_check_ans_key_bool
327     \bool_gset_false:N \g__enumext_standar_bool
328     \bool_gset_false:N \g__enumext_starred_bool
329   }
330 \cs_new_protected:Nn \__enumext_reset_global_tl:
331   {
332     \tl_gclear:N \g__enumext_store_name_tl
333     \tl_gclear:N \g__enumext_start_line_tl
334     \tl_gclear:N \g__enumext_envir_name_tl
335   }
```

(*End of definition for* __enumext_reset_global_vars: *and others.*)

`\__enumext_log_global_vars:`
`\__enumext_log_answer_vars:`

The function `\__enumext_log_global_vars:` will be passed to the function `\__enumext_execute_-after_env:` and write to the `.log` file the number of elements saved in the ⟨*prop list*⟩ and ⟨*sequence*⟩ created by the `save-ans` key along with the value of the integer variable created for the `resume` key.

```
336 \cs_new_protected:Nn \__enumext_log_global_vars:
337   {
338     \msg_log:nneeee { enumext } { prop-seq-int-hook }
339       { \g__enumext_store_name_tl }
340       { \prop_count:c { g__enumext_ \g__enumext_store_name_tl _prop } }
341       { \seq_count:c { g__enumext_ \g__enumext_store_name_tl _seq } }
342       { \int_use:c { g__enumext_resume_ \g__enumext_store_name_tl _int } }
343   }
```

The function `\__enumext_log_answer_vars:` will be passed to the function `\__enumext_execute_-after_env:` and write to the `.log` file the number of items and answers along with the difference between them.

```
344 \cs_new_protected:Nn \__enumext_log_answer_vars:
345   {
346     \msg_log:nneee { enumext } { item-answer-hook }
347       { \int_use:N \g__enumext_item_number_int }
348       { \int_use:N \g__enumext_item_anskey_int }
349       { \int_eval:n { \g__enumext_item_number_int - \g__enumext_item_anskey_int} }
350   }
```

(*End of definition for* `\__enumext_log_global_vars:` *and* `\__enumext_log_answer_vars:`.)

11.6 Copying `list` and `minipage` environments

The `list` environment provided by LATEX has the following plain form:

```
\list{⟨arg one⟩}{⟨arg two⟩}
  \item[⟨opt⟩]
\endlist
```

As a precaution we copy them using `\__enumext_at_begin_document:n` in case any package redefines the `list` environment or a related command.

`\__enumext_start_list:nn`
`\__enumext_stop_list:`
`\__enumext_item_std:w`

The functions `\__enumext_start_list:nn`, `\__enumext_stop_list:` and `\__enumext_item_-std:w` correspond to copies of `\list`, `\endlist` and `\item` from plain definition of `list` environment.

```
351 \__enumext_at_begin_document:n
352   {
353     \cs_new_eq:NN \__enumext_start_list:nn \list
354     \cs_new_eq:NN \__enumext_stop_list: \endlist
355     \cs_new_eq:NN \__enumext_item_std:w \item
356   }
```

(*End of definition for* `\__enumext_start_list:nn`, `\__enumext_stop_list:`, *and* `\__enumext_item_std:w`.)

The `minipage` environment provided by LATEX has the following (simplified) plain form:

```
\minipage[⟨pos⟩][⟨height⟩][⟨inner-pos⟩]{⟨width⟩}
  ⟨internal implement⟩
\endminipage
```

As a precaution we copy them using `\__enumext_at_begin_document:n` in case any package redefines the `minipage` environment or a related command.

`\__enumext_minipage:w`
`\__enumext_endminipage:`

The functions `\__enumext_minipage:w`, `\__enumext_endminipage:` and correspond to copies of `\minipage`, `\endminipage` from plain definition of `minipage` environment.

```
357 \__enumext_at_begin_document:n
358   {
359     \cs_new_eq:NN \__enumext_minipage:w \minipage
360     \cs_new_eq:NN \__enumext_endminipage: \endminipage
361   }
```

(*End of definition for* `\__enumext_minipage:w` *and* `\__enumext_endminipage:`.)

11.7 The internal `minipage` environment

The function __enumext_internal_mini_page: creates a internal __enumext_mini_env* environment (*custom version* of minipage) setting the \if@minipage switch to *"false"* to allow spaces at the *"above"* of the environment, plus we will add \skip_vertical:N \c_zero_skip to maintain alignment on *"top"* in the first part and \skip_vertical:N \c_zero_skip in the second part to allow spaces *"below"*. This environment will be used internally by the mini-env key, it is not documented in the user interface and is for internal use only. This function is passed to the function __enumext_safe_exec: in the enumext environment definition (§11.38) and __enumext_safe_exec_vii: in the enumext* environment definition (§11.43)

```
362 \cs_new_protected:Nn \__enumext_internal_mini_page:
363   {
364     \int_compare:nNnT { \l__enumext_level_int } = { 0 }
365       {
366         \DeclareDocumentEnvironment{__enumext_mini_env*}{ m }
367           {
368             \__enumext_minipage:w [ t ] { ##1 }
369               \legacy_if_gset_false:n { @minipage }
370               \skip_vertical:N \c_zero_skip
371           }
372           {
373               \skip_vertical:N \c_zero_skip
374             \__enumext_endminipage:
375           }
376       }
377   }
```

(*End of definition for* __enumext_internal_mini_page: *and* __enumext_mini_env*.)

11.8 Compatibility with hyperref and footnotehyper

First we define the necessary rules using *"hooks"* to determine if the hyperref package is loaded.

```
378 \hook_gput_code:nnn { begindocument } { enumext } { \__enumext_after_hyperref: }
379 \hook_gset_rule:nnnn { begindocument } { enumext } { after } { hyperref }
```

The function __enumext_after_hyperref: sets the state of the boolean variable \l__enumext_-hyperref_bool to "true" if the package is loaded. At this point we will use the public macro \IfHyperBoolean to determine if the hyperfootnotes=true key is present, if so, we set the state of the boolean variable __enumext_footnotes_key_bool to "true".

```
380 \cs_new_protected:Nn \__enumext_after_hyperref:
381   {
382     \IfPackageLoadedTF { hyperref }
383       {
384         \msg_info:nnn { enumext } { package-load } { hyperref }
385         \bool_set_true:N \l__enumext_hyperref_bool
386         \IfHyperBoolean{hyperfootnotes}
387           {
388             \typeout{hyperfootnotes=true}
389             \bool_set_true:N \l__enumext_footnotes_key_bool
390           }
391           { \typeout{hyperfootnotes=false} }
392       }
393       {  }
```

If the state of the variable \l__enumext_footnotes_key_bool is true we will check if the package footnotehyper is loaded, in case it is not present, we will set the value of \l__enumext_footnotes_-key_bool to false and we will redefine \footnote.

```
394     \bool_if:NT \l__enumext_footnotes_key_bool
395       {
396         \IfPackageLoadedTF { footnotehyper }
397           {
398             \msg_info:nnn { enumext } { package-load } { footnotehyper }
399           }
400           {
401             \typeout{No ~ footnotehyper ~ load}
402             \typeout{Load ~ and  ~ use  ~ \string\makesavenoteenv{enumext*}}
403             \bool_set_false:N \l__enumext_footnotes_key_bool
404           }
405       }
```

The functions `\__enumext_hypertarget:nn` and `\__enumext_phantomsection:` correspond to the internal copies of `\hypertarget` and `\phantomsection`. If the boolean variable `\l__enumext_hyperref_bool` is false the functions `\__enumext_hypertarget:nn` and `\__enumext_phantomsection:` will be disabled.

```
406    \bool_if:NTF \l__enumext_hyperref_bool
407      {
408        \cs_new_eq:NN \__enumext_hypertarget:nn \hypertarget
409        \cs_new_eq:NN \__enumext_phantomsection: \phantomsection
410      }
411      {
412        \cs_new_eq:NN \__enumext_hypertarget:nn \use_none:nn
413        \cs_new_eq:NN \__enumext_phantomsection: \prg_do_nothing:
414      }
415    }
```

(*End of definition for* `\__enumext_after_hyperref:` , `\__enumext_hypertarget:nn` , *and* `\__enumext_phantomsection:`.)

`\__enumext_newlabel:nn` The function `\__enumext_newlabel:nn` write the information to the `.aux` file when using the `save-ref` key. The arguments taken by the function are:

#1 : `\l__enumext_newlabel_arg_one_tl`
#2 : `\l__enumext_newlabel_arg_two_tl`

The trick here is to manage the number of arguments passed to `\newlabel{#1}{#2}` according to the presence of the hyperref package.

```
416  \cs_new_protected:Npn \__enumext_newlabel:nn #1 #2
417    {
418      \protected@write \@auxout { }
419        {
420          \token_to_str:N \newlabel {#1}
421            {
422              {#2}
423              \bool_if:NT \l__enumext_hyperref_bool
424                { { \thepage } {#2} {#1} }
425              { }
426            }
427        }
428      \__enumext_hypertarget:nn {#1} { }
429      \__enumext_phantomsection:
430    }
```

(*End of definition for* `\__enumext_newlabel:nn`.)

11.9 Definition of public dimension

The package enumext only provides a single public dimension `\itemwidth` and is intended for user convenience only and is not for internal use as such. This dimension is set in all environments and is only used by the `wrap-ans` key at its default value.

```
431  \dim_zero_new:N \itemwidth
```

11.10 Definition of counters

`\__enumext_define_counters:Nn`
`\__enumext_define_counters:cn`
To create the necessary *"counters"* we must first make sure that they are not already defined by the user or a package such as enumitem, otherwise a error will be returned and the package loading will be aborted. The arguments taken by the function are:

#1 : A token list `\l__enumext_counter_X_tl` for *"store"* the counter's name.
#2 : The counter's name.

```
432  \cs_new_protected:Npn \__enumext_define_counters:Nn #1 #2
433    {
434      \cs_if_exist:cTF { c@ #2 }
435        { \msg_fatal:nnn { enumext } { counters }{ #2 } }
436        {
437          \tl_set:Nn #1 { #2 }
438          \newcounter { #2 }
439        }
440    }
```

(*End of definition for* `\__enumext_define_counters:Nn`.)

The counters created here are `enumXi`, `enumXii`, `enumXiii` and `enumXiv` for `enumext` environment, `enumXv` for `keyans` environment, `enumXvi` for `keyanspic` environment, `enumXvii` for `enumext*` and `enumXviii` for the `keyans*` environments.

enumXi
enumXii
enumXiii
enumXiv
enumXv
enumXvi
enumXvii
enumXviii

```
441 \__enumext_define_counters:Nn \l__enumext_counter_i_tl    { enumXi     }
442 \__enumext_define_counters:Nn \l__enumext_counter_ii_tl   { enumXii    }
443 \__enumext_define_counters:Nn \l__enumext_counter_iii_tl  { enumXiii   }
444 \__enumext_define_counters:Nn \l__enumext_counter_iv_tl   { enumXiv    }
445 \__enumext_define_counters:Nn \l__enumext_counter_v_tl    { enumXv     }
446 \__enumext_define_counters:Nn \l__enumext_counter_vi_tl   { enumXvi    }
447 \__enumext_define_counters:Nn \l__enumext_counter_vii_tl  { enumXvii   }
448 \__enumext_define_counters:Nn \l__enumext_counter_viii_tl { enumXviii  }
```

(*End of definition for* enumXi *and others.*)

11.11 Definition of labels

This part of the code is inspired by the `enumitem` package. The idea is to be able to access the counters using `\arabic*`, `\Alph*`, `\alph*`, `\Roman*` and `\roman*` to use them in the `label` key.

`\__enumext_register_counter_style:Nn`

These ⟨*counters*⟩ will be used as default ⟨*labels*⟩ if the `label` key is not used for the different levels of the `enumext` environment and the `keyans` environment, so it is necessary to get a default value for `labelwidth` from these ⟨*labels*⟩ at the same time.

```
449 \cs_new_protected:Npn \__enumext_register_counter_style:Nn #1 #2
450   {
451     \tl_const:cn { c__enumext_widest_ \cs_to_str:N #1 _tl } {#2}
452     \tl_gput_right:Nn \g__enumext_counter_styles_tl {#1}
453   }
454 \__enumext_register_counter_style:Nn \arabic { 0 }
455 \__enumext_register_counter_style:Nn \Alph   { M }
456 \__enumext_register_counter_style:Nn \alph   { m }
457 \__enumext_register_counter_style:Nn \Roman  { VIII }
458 \__enumext_register_counter_style:Nn \roman  { viii }
```

(*End of definition for* __enumext_register_counter_style:Nn.)

`\__enumext_label_width_by_box:Nn`
`\__enumext_label_width_by_box:cv`

The function `\__enumext_label_width_by_box:Nn` set the default `\labelwidth` using a box width if no `labelwidth` key is passed.

```
459 \cs_new_protected:Npn \__enumext_label_width_by_box:Nn #1 #2
460   {
461     \hbox_set:Nn \l__enumext_label_width_by_box {#2}
462     \dim_set:Nn #1 { \box_wd:N \l__enumext_label_width_by_box }
463   }
464 \cs_generate_variant:Nn \__enumext_label_width_by_box:Nn { cv }
```

(*End of definition for* __enumext_label_width_by_box:Nn.)

`\__enumext_label_style:Nnn`
`\__enumext_label_style:cvn`

The function `\__enumext_label_style:Nnn` is used by the `label` key to creates the variables containing the ⟨*label style*⟩ and will allow to use `\arabic*`, `\Alph*`, `\alph*`, `\Roman*` and `\roman*` as arguments. It loops through the defined counter styles in `\g__enumext_counter_styles_tl` (`\arabic`, `\alph`, `\Alph`, `\roman`, and `\Roman`) for example, looking for `\roman*` and replacing that by `\roman{`⟨*counter*⟩`}`, and doing the same for the `\g__enumext_widest_label_tl` to keep both in sync.

```
465 \cs_new_protected:Npn \__enumext_label_style:Nnn #1 #2 #3
466   {
467     \tl_clear_new:N #1
468     \tl_put_right:Ne #1 { \tl_trim_spaces:n {#3} }
469     \tl_gset_eq:NN \g__enumext_widest_label_tl #1
470     \tl_map_inline:Nn \g__enumext_counter_styles_tl
471       {
472         \tl_replace_all:Nne #1 { ##1* } { \exp_not:N ##1 {#2} }
473         \tl_greplace_all:Nne \g__enumext_widest_label_tl { ##1* }
474           { \tl_use:c { c__enumext_widest_ \cs_to_str:N ##1 _tl } }
475       }
476     \__enumext_label_width_by_box:Nn \l__enumext_current_widest_dim
477       { \tl_use:N \g__enumext_widest_label_tl }
478     \tl_set_eq:cN { the #2 } #1
479   }
480 \cs_generate_variant:Nn \__enumext_label_style:Nnn { cvn }
```

(*End of definition for* __enumext_label_style:Nnn.)

11.12 Setting keys associated with label

font
labelsep
labelwidth
wrap-label
wrap-label*

Definition of keys `font`, `labelsep`, `labelwidth`, `wrap-label` and `wrap-label*` keys for `enumext` and `keyans` environments.

```
481 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
482   {
483     \keys_define:nn { enumext / #1 }
484       {
485         font        .tl_set:c   = { l__enumext_label_font_style_#2_tl },
486         font        .value_required:n = true,
487         labelsep    .dim_set:c  = { l__enumext_labelsep_#2_dim },
488         labelsep    .initial:n  = {0.3333em},
489         labelsep    .value_required:n = true,
490         labelwidth  .dim_set:c  = { l__enumext_labelwidth_#2_dim },
491         labelwidth  .value_required:n = true,
492         wrap-label  .cs_set_protected:cp = { __enumext_wrapper_label_#2:n } ##1,
493         wrap-label  .initial:n  = {##1},
494         wrap-label  .value_required:n = true,
495         wrap-label* .code:n = {
496                               \bool_set_true:c { l__enumext_wrap_label_opt_#2_bool }
497                               \keys_set:nn { enumext / #1 } { wrap-label = {##1} }
498                             },
499         wrap-label* .value_required:n = true,
500       }
501   }
502 \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }
```

(*End of definition for font and others.*)

💣 In this point, the following are set `\__enumext_wrapper_label_X:n` which will be used by `\__enumext_make_-label:` for the different levels of the `enumext` environment and is set to `\__enumext_wrapper_label_v:n` which will be used by `\__enumext_keyans_make_label:` for `keyans` and `keyanspic` environments.

align

The `align` key is implemented differently for *"starred"* and *"non starred"* environments.

```
503 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
504   {
505     \keys_define:nn { enumext / #1 }
506       {
507         align .choice:,
508         align / left    .code:n =
509                           {
510                             \tl_clear:c { l__enumext_label_fill_left_#2_tl  }
511                             \tl_set:cn  { l__enumext_label_fill_right_#2_tl } { \hfill }
512                           },
513         align / right   .code:n =
514                           {
515                             \tl_set:cn  { l__enumext_label_fill_left_#2_tl  } { \hfill }
516                             \tl_clear:c { l__enumext_label_fill_right_#2_tl }
517                           },
518         align / center  .code:n =
519                           {
520                             \tl_set:cn { l__enumext_label_fill_left_#2_tl  } { \hfill }
521                             \tl_set:cn { l__enumext_label_fill_right_#2_tl } { \hfill }
522                           },
523         align / unknown .code:n =
524                           \msg_error:nneee { enumext } { unknown-choice }
525                             { align } { left, ~ right, ~  center } { \exp_not:n {##1} },
526         align .initial:n  = left,
527         align .value_required:n  = true,
528       }
529   }
530 \clist_map_inline:nn
531   {
532     {level-1}{i}, {level-2}{ii}, {level-3}{iii}, {level-4}{iv}, {keyans}{v}
533   }
534   { \__enumext_tmp:nn #1 }

535 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
536   {
537     \keys_define:nn { enumext / #1 }
538       {
539         align .choice:,
```

```
540        align / left      .code:n = \str_set:cn { l__enumext_align_label_#2_str } { l },
541        align / right     .code:n = \str_set:cn { l__enumext_align_label_#2_str } { r },
542        align / center    .code:n = \str_set:cn { l__enumext_align_label_#2_str } { c },
543        align / unknown .code:n =
544                            \msg_error:nneee { enumext } { unknown-choice }
545                              { align } { left, ~ right, ~  center } { \exp_not:n {##1} },
546        align .initial:n = left,
547        align .value_required:n = true,
548      }
549    }
550 \clist_map_inline:nn { {enumext*}{vii}, {keyans*}{viii} } { \__enumext_tmp:nn #1 }
```

(*End of definition for* align.)

11.13   Setting label and ref keys

The implementation of the keys label and ref are part of the core of the package enumext, here the default values for ⟨*label*⟩, the value of the variables \l__enumext_label_X_tl, the default values for \labelwidth and the *"label and ref"* system.

11.13.1   Define and set label and ref keys for enumext environment

label
ref
\l__enumext_label_i_tl
\l__enumext_label_ii_tl
\l__enumext_label_iii_tl
\l__enumext_label_iv_tl

Here we set the default ⟨*labels*⟩ of the *four levels* of enumext environment, along with the default value for labelwidth key and ref key.

```
551 \cs_set_protected:Npn \__enumext_tmp:nnn #1 #2 #3
552   {
553     \keys_define:nn { enumext / #1 }
554       {
555         label .code:n    = {
556                             \__enumext_label_style:cvn { l__enumext_label_#2_tl }
557                               { l__enumext_counter_#2_tl } {##1}
558                             \dim_set_eq:cN  { l__enumext_labelwidth_#2_dim }
559                               \l__enumext_current_widest_dim
560                           },
561         label .initial:n = #3,
562         label .value_required:n = true,
563         ref   .code:n    = \__enumext_standar_ref:n {##1},
564         ref   .value_required:n = true,
565       }
566   }
567 \__enumext_tmp:nnn { level-1 } {   i } { \arabic*.}
568 \__enumext_tmp:nnn { level-2 } {  ii } { (\alph*) }
569 \__enumext_tmp:nnn { level-3 } { iii } { \roman*. }
570 \__enumext_tmp:nnn { level-4 } {  iv } { \Alph*.  }
```

(*End of definition for* label *and others.*)

__enumext_standar_ref:n
__enumext_standar_ref:

The __enumext_standar_ref:n first we will pass the key argument to \l__enumext_ref_key_-arg_tl and we will analyze its state, if it is not *empty* we will make a copy of the current counter in \l__enumext _ref_the_count_tl and we will execute the function __enumext_regex_counter_-style: which will return the modified \l__enumext_ref_key_arg_tl and we make the value of \l__enumext_ref_the_count_tl the same as that \l__enumext_the_counter_X_tl which contains \theenumX and finally we set \l__enumext_renew_the_count_X_tl with the renewed command.

```
571 \cs_new_protected:Npn \__enumext_standar_ref:n #1
572   {
573     \tl_set:Nn \l__enumext_ref_key_arg_tl {#1}
574     \tl_if_empty:NTF \l__enumext_ref_key_arg_tl
575       {
576         \msg_error:nnn { enumext } { key-ref-empty } { enumext }
577       }
578       {
579         \tl_set_eq:Nc
580           \l__enumext_ref_the_count_tl { l__enumext_counter_ \__enumext_level: _tl }
581         \__enumext_regex_counter_style:
582         \tl_set_eq:Nc
583           \l__enumext_ref_the_count_tl { l__enumext_the_counter_ \__enumext_level: _tl }
584         \tl_put_right:ce { l__enumext_renew_the_count_ \__enumext_level: _tl }
585           {
586             \exp_not:N \renewcommand { \exp_not:V \l__enumext_ref_the_count_tl }
587               { \exp_not:V \l__enumext_ref_key_arg_tl }
588           }
589       }
590   }
```

Finally the function `\__enumext_standar_ref:` will execute the modification for the reference system in the second argument of the environment definition `enumext`.

```
591  \cs_new_protected:Nn \__enumext_standar_ref:
592    {
593      \tl_if_empty:cF { l__enumext_renew_the_count_ \__enumext_level: _tl }
594        {
595          \tl_use:c { l__enumext_renew_the_count_ \__enumext_level: _tl }
596        }
597    }
```

(*End of definition for __enumext_standar_ref:n and __enumext_standar_ref:.*)

11.13.2   Define and set `label` and `ref` keys for `enumext*` and `keyans*` environments

`label`
`ref`
`\l__enumext_label_vii_tl`
`\l__enumext_label_viii_tl`

Here we set the default ⟨*labels*⟩ for `enumext*` and `keyans*` environments, along with the default value for `labelwidth` key and `ref` key.

```
598  \cs_set_protected:Npn \__enumext_tmp:nnn #1 #2 #3
599    {
600      \keys_define:nn { enumext / #1 }
601        {
602          label .code:n    = {
603                            \__enumext_label_style:cvn { l__enumext_label_#2_tl }
604                              { l__enumext_counter_#2_tl } {##1}
605                            \dim_set_eq:cN  { l__enumext_labelwidth_#2_dim }
606                              \l__enumext_current_widest_dim
607                          },
608          label .initial:n = #3,
609          label .value_required:n = true,
610          ref    .code:n    = \__enumext_starred_ref:n {##1},
611          ref    .value_required:n = true,
612        }
613    }
614  \__enumext_tmp:nnn { enumext* } {  vii } { \arabic*.}
615  \__enumext_tmp:nnn { keyans*  } { viii } { \Alph*) }
```

(*End of definition for label and others.*)

`\__enumext_starred_ref:n`
`\__enumext_starred_ref:`

The implementation of `\__enumext_starred_ref:n` is the same as that used for the environment `enumext`.

```
616  \cs_new_protected:Npn \__enumext_starred_ref:n #1
617    {
618      \tl_set:Nn \l__enumext_ref_key_arg_tl {#1}
619      \int_compare:nNnT { \l__enumext_level_h_int } = { 1 }
620        {
621          \tl_if_empty:NTF \l__enumext_ref_key_arg_tl
622            {
623              \msg_error:nnn { enumext } { key-ref-empty } { enumext* }
624            }
625            {
626              \tl_set_eq:NN \l__enumext_ref_the_count_tl \l__enumext_counter_vii_tl
627              \__enumext_regex_counter_style:
628              \tl_set_eq:NN \l__enumext_ref_the_count_tl \l__enumext_the_counter_vii_tl
629              \tl_put_right:Ne \l__enumext_renew_the_count_vii_tl
630                {
631                  \exp_not:N \renewcommand { \exp_not:V \l__enumext_ref_the_count_tl }
632                    { \exp_not:V \l__enumext_ref_key_arg_tl }
633                }
634            }
635        }
636      \int_compare:nNnT { \l__enumext_keyans_level_h_int } = { 1 }
637        {
638          \tl_if_empty:NTF \l__enumext_ref_key_arg_tl
639            {
640              \msg_error:nnn { enumext } { key-ref-empty } { keyans* }
641            }
642            {
643              \tl_set_eq:NN \l__enumext_ref_the_count_tl \l__enumext_counter_viii_tl
644              \__enumext_regex_counter_style:
645              \tl_set_eq:NN \l__enumext_ref_the_count_tl \l__enumext_the_counter_viii_tl
646              \tl_put_right:Ne \l__enumext_renew_the_count_viii_tl
647                {
648                  \exp_not:N \renewcommand { \exp_not:V \l__enumext_ref_the_count_tl }
```

```
649                      { \exp_not:V \l__enumext_ref_key_arg_tl }
650                  }
651              }
652          }
653      }
```

Finally the function `\__enumext_starred_ref:` will execute the modification for the reference system in the second argument of the `enumext*` and `keyans*` environment definition.

```
654  \cs_new_protected:Nn \__enumext_starred_ref:
655      {
656          \int_compare:nNnT { \l__enumext_level_h_int } = { 1 }
657              {
658                  \tl_if_empty:NF \l__enumext_renew_the_count_vii_tl
659                      {
660                          \tl_use:N \l__enumext_renew_the_count_vii_tl
661                      }
662              }
663          \int_compare:nNnT { \l__enumext_keyans_level_h_int } = { 1 }
664              {
665                  \tl_if_empty:NF \l__enumext_renew_the_count_viii_tl
666                      {
667                          \tl_use:N \l__enumext_renew_the_count_viii_tl
668                      }
669              }
670      }
```

(*End of definition for* `\__enumext_starred_ref:n` *and* `\__enumext_starred_ref:`.)

11.13.3 Define and set `label` and `ref` keys for `keyans` and `keyanspic` environments

label
ref
`\l__enumext_label_v_tl`
`\l__enumext_label_vi_tl`

Here we set the default ⟨*label*⟩ for `keyans` and `keyanspic` environment, along with the default value for `labelwidth` and `ref` key. The `keyanspic` environment use the same ⟨*label*⟩ as the `keyans` environment.

```
671  \keys_define:nn { enumext / keyans }
672      {
673          label .code:n     = {
674                              \__enumext_label_style:cvn { l__enumext_label_v_tl }
675                                { l__enumext_counter_v_tl } {#1}
676                              \dim_set_eq:cN  { l__enumext_labelwidth_v_dim }
677                                \l__enumext_current_widest_dim
678                              \__enumext_label_style:cvn { l__enumext_label_vi_tl }
679                                { l__enumext_counter_vi_tl } {#1}
680                              \dim_set_eq:cN  { l__enumext_labelwidth_v_dim }
681                                \l__enumext_current_widest_dim
682                             },
683          label .initial:n = \Alph*),
684          label .value_required:n = true,
685          ref   .code:n     = \__enumext_keyans_ref:n {#1},
686          ref   .value_required:n = true,
687      }
```

(*End of definition for* `label` *and others.*)

`\__enumext_keyans_ref:n`
`\__enumext_keyans_ref:`

The implementation of `\__enumext_keyans_ref:n` is the same as that used for the environment `enumext`.

```
688  \cs_new_protected:Npn \__enumext_keyans_ref:n #1
689      {
690          \tl_set:Nn \l__enumext_ref_key_arg_tl {#1}
691          \tl_if_empty:NTF \l__enumext_ref_key_arg_tl
692              {
693                  \msg_error:nnn { enumext } { key-ref-empty } { keyans }
694              }
695              {
696                  \tl_set_eq:NN \l__enumext_ref_the_count_tl \l__enumext_counter_v_tl
697                  \__enumext_regex_counter_style:
698                  \tl_set_eq:NN \l__enumext_ref_the_count_tl \l__enumext_the_counter_v_tl
699                  \tl_put_right:Ne \l__enumext_renew_the_count_v_tl
700                      {
701                          \exp_not:N \renewcommand { \exp_not:V \l__enumext_ref_the_count_tl }
702                              { \exp_not:V \l__enumext_ref_key_arg_tl }
703                      }
704                  }
705          }
```

Finally the function __enumext_keyans_ref: will execute the modification for the reference system in the second argument of the keyans* environment definition.

```
706  \cs_new_protected:Nn \__enumext_keyans_ref:
707    {
708      \tl_if_empty:NF \l__enumext_renew_the_count_v_tl
709        {
710          \tl_use:N \l__enumext_renew_the_count_v_tl
711        }
712    }
```

(*End of definition for* __enumext_keyans_ref:n *and* __enumext_keyans_ref:.)

11.14 Setting start, start* and widest keys

__enumext_start_from:NNn
__enumext_start_from:ccn
__enumext_start_from:cce

The function __enumext_start_from:NNn used by start and start* keys take three arguments:

#1 : \l__enumext_label_X_tl
#2 : \l__enumext_start_X_int
#3 : ⟨*integer or string*⟩

The first argument of this function are the *"counter style"* set by label key, the second argument is returned by the function, the third argument can be an ⟨*integer*⟩ or ⟨*string*⟩ of the form \Alph, \alph, \Roman or \roman. This effectively allows start=A or start=1 to be used.

```
713  \cs_new_protected:Npn \__enumext_start_from:NNn #1 #2 #3
714    {
715      \__enumext_if_is_int:nTF { #3 }
716        {
717          \int_set:Nn #2 {#3}
718        }
719        {
720          \regex_match:nVT { \c{Alph} | \c{alph} } {#1}
721            { \int_set:Nn #2 { \int_from_alph:n {#3} } }
722          \regex_match:nVT { \c{Roman} | \c{roman} } {#1}
723            { \int_set:Nn #2  { \int_from_roman:n {#3} } }
724        }
725    }
726  \cs_generate_variant:Nn \__enumext_start_from:NNn { ccn, cce }
```

(*End of definition for* __enumext_start_from:NNn.)

__enumext_widest_from:nNNn
__enumext_widest_from:nccn

The function __enumext_widest_from:nNNn used by the widest key take four arguments:

#1 : The counter associated with the environment level
#2 : \l__enumext_label_X_tl
#3 : \l__enumext_labelwidth_X_dim
#4 : ⟨*integer or string*⟩

The second and third arguments of this function are the values set by label and labelwidth keys, the four argument can be an ⟨*integer*⟩ or ⟨*string*⟩ of the form \Alph, \alph, \Roman or \roman. The value of the four argument is set temporarily for the identified counter in this point (level), then the value is expanded into a *"box"* and the *"width"* of the *"box"* is returned.

```
727  \cs_new_protected:Npn \__enumext_widest_from:nNNn #1 #2 #3 #4
728    {
729      \__enumext_if_is_int:nTF {#4}
730        {
731          \setcounter{enumX#1} { #4 }
732        }
733        {
734          \regex_match:nVT { \c{Alph} | \c{alph} } {#2}
735            { \setcounter{enumX#1} { \int_from_alph:n {#4} } }
736          \regex_match:nVT { \c{Roman} | \c{roman} } {#2}
737            { \setcounter{enumX#1} { \int_from_roman:n {#4} } }
738        }
739      \__enumext_label_width_by_box:cv
740        { l__enumext_labelwidth_#1_dim } { l__enumext_label_#1_tl }
741    }
742  \cs_generate_variant:Nn \__enumext_widest_from:nNNn { nccn }
```

(*End of definition for* __enumext_widest_from:nNNn.)

start
start*
widest

Now define and set start, start* and widest keys for enumext, enumext*, keyans and keyans* environments.

```
743  \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
744    {
```

```
745     \keys_define:nn { enumext / #1 }
746       {
747         start  .code:n    = {
748                               \__enumext_start_from:ccn
749                                 { l__enumext_label_#2_tl }
750                                 { l__enumext_start_#2_int } {##1}
751                             },
752         start  .initial:n = 1,
753         start  .value_required:n = true,
754         start* .code:n    = {
755                               \__enumext_start_from:cce
756                                 { l__enumext_label_#2_tl }
757                                 { l__enumext_start_#2_int } { \int_eval:n {##1} }
758                             },
759         start* .value_required:n = true,
760         widest .code:n    = {
761                               \__enumext_widest_from:nccn {#2}
762                                 { l__enumext_label_#2_tl }
763                                 { l__enumext_labelwidth_#2_dim } {##1}
764                             },
765         widest .value_required:n = true,
766       }
767   }
768 \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }
```

(*End of definition for* start *,* start* *, and* widest*.*)

11.15   Setting keys for vertical spaces

topsep
partopsep
parsep
noitemsep
nosep

Define and set topsep, partopsep, parsep, itemsep, noitemsep and nosep keys for enumext, enumext*, keyans and keyans* environments.

```
769 \cs_set_protected:Npn \__enumext_tmp:nnnnnn #1 #2 #3 #4 #5 #6
770   {
771     \keys_define:nn { enumext / #1 }
772       {
773         topsep    .skip_set:c = { l__enumext_topsep_#2_skip },
774         topsep    .initial:n  = {#3},
775         topsep    .value_required:n = true,
776         partopsep .skip_set:c = { l__enumext_partopsep_#2_skip },
777         partopsep .initial:n  = {#4},
778         partopsep .value_required:n = true,
779         parsep    .skip_set:c = { l__enumext_parsep_#2_skip },
780         parsep    .initial:n  = {#5},
781         parsep    .value_required:n = true,
782         itemsep   .skip_set:c = { l__enumext_itemsep_#2_skip },
783         itemsep   .initial:n  = {#6},
784         itemsep   .value_required:n = true,
785         noitemsep .meta:n     = { itemsep = 0pt, parsep = 0pt },
786         noitemsep .value_forbidden:n = true,
787         nosep     .meta:n     = {
788                                 itemsep = 0pt, parsep= 0pt,
789                                 topsep = 0pt, partopsep = 0pt,
790                                 },
791         nosep     .value_forbidden:n = true,
792       }
793   }
```

Now we set the values based on standard article class in 10pt.

```
794 \__enumext_tmp:nnnnnn { level-1 } { i } { 8.0pt plus 2.0pt minus 4.0pt }
795   { 2.0pt plus 1.0pt minus 1.0pt } { 4.0pt plus 2.0pt minus 1.0pt }
796   { 4.0pt plus 2.0pt minus 1.0pt }
797 \__enumext_tmp:nnnnnn { level-2 } { ii } { 4.0pt plus 2.0pt minus 1.0pt }
798   { 2.0pt plus 1.0pt minus 1.0pt } { 2.0pt plus 1.0pt minus 1.0pt }
799   { 2.0pt plus 1.0pt minus 1.0pt }
800 \__enumext_tmp:nnnnnn { level-3 } { iii } { 2.0pt plus 1.0pt minus 1.0pt }
801   { 1.0pt minus 1.0pt }{ 0pt }{ 2.0pt plus 1.0pt minus 1.0pt }
802 \__enumext_tmp:nnnnnn { level-4 } { iv } { 2.0pt plus 1.0pt minus 1.0pt }
803   { 1.0pt minus 1.0pt }{ 0pt }{ 2.0pt plus 1.0pt minus 1.0pt }
804 \__enumext_tmp:nnnnnn { keyans  } { v }{ 4.0pt plus 2.0pt minus 1.0pt }
805   { 2.0pt plus 1.0pt minus 1.0pt }{ 2.0pt plus 1.0pt minus 1.0pt }
806   { 2.0pt plus 1.0pt minus 1.0pt }
807 \__enumext_tmp:nnnnnn { enumext* } { vii } { 8.0pt plus 2.0pt minus 4.0pt }
```

```
808    { 2.0pt plus 1.0pt minus 1.0pt } { 4.0pt plus 2.0pt minus 1.0pt }
809    { 4.0pt plus 2.0pt minus 1.0pt }
810  \__enumext_tmp:nnnnnn { keyans* } { viii } { 4.0pt plus 2.0pt minus 1.0pt }
811    { 2.0pt plus 1.0pt minus 1.0pt } { 2.0pt plus 1.0pt minus 1.0pt }
812    { 2.0pt plus 1.0pt minus 1.0pt }
```

(*End of definition for* `topsep` *and others.*)

11.16 Setting `base-fix` key

When nesting starting right after `\item` (without material between them) there is a problem with the alignment of the baseline between the two environments. One way to get around this problem is to place `\mode_leave_vertical:` and then apply `\vspace{-\baselineskip}` and set `topsep=0pt` for the *"first level"* of the nested `enumext` or `enumext*` environments.

`base-fix`
`\__enumext_nested_base_line_fix:`

We define the key `base-fix` only for the *"first level"* of `enumext` and `enumext*`.

```
813  \cs_set_protected:Npn \__enumext_tmp:n #1
814    {
815      \keys_define:nn { enumext / #1 }
816        {
817          base-fix .bool_set:N = \l__enumext_base_line_fix_bool,
818          base-fix .initial:n  = false,
819          base-fix .value_forbidden:n = true,
820        }
821    }
822  \clist_map_inline:nn { level-1, enumext* } { \__enumext_tmp:n {#1} }
```

The function `\__enumext_nested_base_line_fix:` will be in charge of applying the baseline correction and adjusting the ⟨*keys*⟩. This function is passed to the function `\__enumext_parse_keys:n` in the `enumext` environment definition (§11.38) and to the function `\__enumext_parse_keys_vii:n` in the `enumext*` environment definition (§11.43).

```
823  \cs_new_protected:Nn \__enumext_nested_base_line_fix:
824    {
825      \bool_lazy_and:nnT
826        { \bool_if_p:N \l__enumext_standar_first_bool }
827        { \bool_if_p:N \l__enumext_base_line_fix_bool }
828        {
829          \mode_leave_vertical:
830          \vspace { -\baselineskip }
831          \keys_set:nn { enumext / level-1 }
832            {
833              topsep = 0pt, above = 0pt, above* = 0pt,
834            }
835        }
836      \bool_lazy_and:nnT
837        { \bool_if_p:N \l__enumext_starred_first_bool }
838        { \bool_if_p:N \l__enumext_base_line_fix_bool }
839        {
840          \mode_leave_vertical:
841          \vspace { -\baselineskip }
842          \keys_set:nn { enumext / enumext* }
843            {
844              topsep = 0pt, above = 0pt, above* = 0pt,
845            }
846        }
847      \bool_set_false:N \l__enumext_base_line_fix_bool
848    }
```

💣 This key is enabled by default in the command `\printkeyans` (§11.46).

(*End of definition for* `base-fix` *and* `\__enumext_nested_base_line_fix:`.)

11.17 Setting keys for horizontal spaces

`itemindent`
`rightmargin`
`listparindent`
`list-offset`
`list-indent`

Define and set `itemindent`, `rightmargin`, `listparindent`, `list-offset` and `list-indent` keys for `enumext`, `enumext*`, `keyans` and `keyans*` environments.

```
849  \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
850    {
851      \keys_define:nn { enumext / #1 }
852        {
853          itemindent    .dim_set:c = { l__enumext_fake_item_indent_#2_dim },
854          itemindent    .value_required:n = true,
855          rightmargin   .dim_set:c = { l__enumext_rightmargin_#2_dim },
```

```
856          rightmargin   .value_required:n = true,
857          listparindent .dim_set:c = { l__enumext_listparindent_#2_dim },
858          listparindent .value_required:n = true,
859          list-offset   .dim_set:c = { l__enumext_listoffset_#2_dim },
860          list-offset   .value_required:n = true,
861          list-indent   .code:n    =
862                           \bool_set_true:c { l__enumext_leftmargin_tmp_#2_bool }
863                           \dim_set:cn { l__enumext_leftmargin_tmp_#2_dim } {##1},
864          list-indent   .value_required:n = true,
865        }
866    }
867  \clist_map_inline:nn
868    {
869      {level-1}{i}, {level-2}{ii}, {level-3}{iii}, {level-4}{iv}, {keyans}{v}
870    }
871    { \__enumext_tmp:nn #1 }
```

(*End of definition for* itemindent *and others.*)

For enumext* and keyans* environments the situation is a bit different, the list-indent key behaves like the list-offset key.

```
872  \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
873    {
874      \keys_define:nn { enumext / #1 }
875        {
876          itemindent    .dim_set:c = { l__enumext_fake_item_indent_#2_dim },
877          itemindent    .value_required:n = true,
878          rightmargin   .dim_set:c = { l__enumext_rightmargin_#2_dim },
879          rightmargin   .value_required:n = true,
880          listparindent .dim_set:c = { l__enumext_listparindent_#2_dim },
881          listparindent .value_required:n = true,
882          list-offset   .dim_set:c = { l__enumext_listoffset_#2_dim },
883          list-offset   .value_required:n = true,
884          list-indent   .meta:n    = { list-offset = ##1 },
885          list-indent   .value_required:n = true,
886        }
887    }
888  \clist_map_inline:nn
889    {
890      {enumext*}{vii}, {keyans*}{viii}
891    }
892    { \__enumext_tmp:nn #1 }
```

11.17.1 Functions for setting the fake itemindent

__enumext_fake_item:
__enumext_keyans_fake_item:
__enumext_fake_item_vii:
__enumext_fake_item_viii:

The itemindent key does not set the value of \itemindent, it only sets the value of the *horizontal space* applied using \skip_horizontal:N. We will store this value in the variable and only apply it when it is greater than 0pt. Here I will need to place \mode_leave_vertical: and the plain TeX macro \ignorespaces to avoid unwanted extra space when using the itemindent key.

```
893  \cs_set_protected:Nn \__enumext_fake_item:
894    {
895      \dim_compare:nNnT
896        { \dim_use:c { l__enumext_fake_item_indent_ \__enumext_level: _dim } }
897        >
898        { \c_zero_dim }
899        {
900          \tl_set:ce { l__enumext_fake_item_indent_ \__enumext_level: _tl }
901            {
902              \exp_not:N \mode_leave_vertical:
903              \exp_not:n { \skip_horizontal:n }
904                { \dim_use:c { l__enumext_fake_item_indent_ \__enumext_level: _dim } }
905              \ignorespaces
906            }
907        }
908    }
909  \cs_set_protected:Nn \__enumext_keyans_fake_item:
910    {
911      \dim_compare:nNnT
912        { \l__enumext_fake_item_indent_v_dim } > { \c_zero_dim }
913        {
914          \tl_set:Ne \l__enumext_fake_item_indent_v_tl
915            {
```

```
916              \exp_not:N \mode_leave_vertical:
917              \exp_not:N \skip_horizontal:N \l__enumext_fake_item_indent_v_dim
918            }
919        }
920     }
921  \cs_set_protected:Nn \__enumext_fake_item_vii:
922    {
923      \dim_compare:nNnT
924        { \l__enumext_fake_item_indent_vii_dim } > { \c_zero_dim }
925        {
926          \tl_set:Ne \l__enumext_fake_item_indent_vii_tl
927            {
928              \exp_not:N \mode_leave_vertical:
929              \exp_not:N \skip_horizontal:N \l__enumext_fake_item_indent_vii_dim
930            }
931        }
932    }
933  \cs_set_protected:Nn \__enumext_fake_item_viii:
934    {
935      \dim_compare:nNnT
936        { \l__enumext_fake_item_indent_viii_dim } > { \c_zero_dim }
937        {
938          \tl_set:Ne \l__enumext_fake_item_indent_viii_tl
939            {
940              \exp_not:N \mode_leave_vertical:
941              \exp_not:N \skip_horizontal:N \l__enumext_fake_item_indent_viii_dim
942            }
943        }
944    }
```

(*End of definition for* __enumext_fake_item: *and others.*)

11.18   Setting show-length key

show-length   Define and set show-length key for enumext, enumext*, keyans and keyans* environments. The function sets the boolean variable \l__enumext_show_length_X_bool used in the definition of all environments to *"true"* and calls the function __enumext_show_length:nnn which prints all the values of the *"vertical"* and *"horizontal"* parameters calculated and used.

```
945  \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
946    {
947      \keys_define:nn { enumext / #1 }
948        {
949          show-length .bool_set:c = { l__enumext_show_length_#2_bool },
950          show-length .initial:n  = false,
951        }
952    }
953  \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }
```

(*End of definition for* show-length.)

11.19   Setting before, after and first keys

before   Define and set before, before*, after and first keys for enumext, enumext*, keyans and keyans*
before*   environments.
after
first
```
954  \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
955    {
956      \keys_define:nn { enumext / #1 }
957        {
958          before  .tl_set:c   = { l__enumext_before_no_starred_key_#2_tl },
959          before  .value_required:n = true,
960          before* .tl_set:c   = { l__enumext_before_starred_key_#2_tl },
961          before* .value_required:n = true,
962          after   .tl_set:c   = { l__enumext_after_stop_list_#2_tl },
963          after   .value_required:n = true,
964          first   .tl_set:c   = { l__enumext_after_list_args_#2_tl },
965          first   .value_required:n = true,
966        }
967    }
968  \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }
```

(*End of definition for* before *and others.*)

11.19.1 Functions for before, after and first keys in enumext

<div style="float:left">__enumext_before_args_exec:
__enumext_before_keys_exec:
__enumext_after_stop_list:
__enumext_after_args_exec:</div>

The function __enumext_before_args_exec: executes the {⟨*code*⟩} set by the before* key *"before"* the enumext environment is started. The {⟨*code*⟩} is executed *"without"* knowing any definition of the {⟨*arg two*⟩} of the list: {⟨*code*⟩}\list{⟨*arg one*⟩}{⟨*arg two*⟩}.

```
969  \cs_new_protected:Nn \__enumext_before_args_exec:
970    {
971      \tl_use:c { l__enumext_before_starred_key_ \__enumext_level: _tl }
972    }
```

The function __enumext_before_keys_exec: executes the {⟨*code*⟩} set by the before key *"before"* the enumext environment is started in *second argument* of the list. The {⟨*code*⟩} is executed *"knowing"* all definition and values provides by ⟨*keys*⟩: \list{⟨*arg one*⟩}{⟨*arg two*⟩{⟨*code*⟩}}

```
973  \cs_new_protected:Nn \__enumext_before_keys_exec:
974    {
975      \tl_use:c { l__enumext_before_no_starred_key_ \__enumext_level: _tl }
976    }
```

The function __enumext_after_stop_list: executes the {⟨*code*⟩} set by the after key *"after"* the enumext environment has finished: \endlist{⟨*code*⟩}.

```
977  \cs_new_protected:Nn \__enumext_after_stop_list:
978    {
979      \tl_use:c { l__enumext_after_stop_list_ \__enumext_level: _tl }
980    }
```

The function __enumext_after_args_exec: executes the {⟨*code*⟩} set by the first key after the end of the second argument of the list defining the enumext environment, just before the first occurrence of \item: \list{⟨*arg one*⟩}{⟨*arg two*⟩}{⟨*code*⟩}\item.

```
981  \cs_new_protected:Nn \__enumext_after_args_exec:
982    {
983      \tl_use:c { l__enumext_after_list_args_ \__enumext_level: _tl }
984    }
```

(*End of definition for* __enumext_before_args_exec: *and others.*)

11.19.2 Functions for before, after and first keys in keyans

<div style="float:left">__enumext_before_args_exec_v:
__enumext_before_keys_exec_v:
__enumext_after_stop_list_v:
__enumext_after_args_exec_v:</div>

Same implementation as the one used in the enumext environment.

```
985  \cs_new_protected:Nn \__enumext_before_args_exec_v:
986    {
987      \tl_use:N \l__enumext_before_starred_key_v_tl
988    }
989  \cs_new_protected:Nn \__enumext_before_keys_exec_v:
990    {
991      \tl_use:N \l__enumext_before_no_starred_key_v_tl
992    }
993  \cs_new_protected:Nn \__enumext_after_stop_list_v:
994    {
995      \tl_use:N \l__enumext_after_stop_list_v_tl
996    }
997  \cs_new_protected:Nn \__enumext_after_args_exec_v:
998    {
999      \tl_use:N \l__enumext_after_list_args_v_tl
1000   }
```

(*End of definition for* __enumext_before_args_exec_v: *and others.*)

11.19.3 Functions for before, after and first keys in enumext* and keyans*

<div style="float:left">__enumext_before_args_exec_vii:
__enumext_before_keys_exec_vii
__enumext_after_stop_list_vii:
__enumext_after_args_exec_vii:</div>

Same implementation as the one used in the enumext environment.

```
1001  \cs_new_protected:Nn \__enumext_before_args_exec_vii:
1002    {
1003      \tl_use:N \l__enumext_before_starred_key_vii_tl
1004    }
1005  \cs_new_protected:Nn \__enumext_before_args_exec_viii:
1006    {
1007      \tl_use:N \l__enumext_before_starred_key_viii_tl
1008    }
1009  \cs_new_protected:Nn \__enumext_before_keys_exec_vii:
1010    {
1011      \tl_use:N \l__enumext_before_no_starred_key_vii_tl
1012    }
1013  \cs_new_protected:Nn \__enumext_before_keys_exec_viii:
1014    {
```

```
1015        \tl_use:N \l__enumext_before_no_starred_key_viii_tl
1016    }
1017 \cs_new_protected:Nn \__enumext_after_stop_list_vii:
1018    {
1019        \tl_use:N \l__enumext_after_stop_list_vii_tl
1020    }
1021 \cs_new_protected:Nn \__enumext_after_stop_list_viii:
1022    {
1023        \tl_use:N \l__enumext_after_stop_list_viii_tl
1024    }
1025 \cs_new_protected:Nn \__enumext_after_args_exec_vii:
1026    {
1027        \tl_use:N \l__enumext_after_list_args_vii_tl
1028    }
1029 \cs_new_protected:Nn \__enumext_after_args_exec_viii:
1030    {
1031        \tl_use:N \l__enumext_after_list_args_viii_tl
1032    }
```

(*End of definition for* __enumext_before_args_exec_vii: *and others.*)

11.20   Setting keys for `multicols` and `minipage`

mini-env
mini-sep
columns-sep
columns

The default value of the `columns-sep` key is handled by the state of the boolean variable `\l__enumext_-columns_sep_X_bool` which is handled in the internal definition of the `enumext` and `keyans` environments. Define and set `mini-env`, `mini-sep`, `columns-sep` and `columns` keys for `enumext`, `enumext*`, `keyans` and `keyans*` environments.

```
1033 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
1034    {
1035        \keys_define:nn { enumext / #1 }
1036          {
1037            mini-env     .dim_set:c  = { l__enumext_minipage_right_#2_dim },
1038            mini-env     .value_required:n = true,
1039            mini-sep     .dim_set:c  = { l__enumext_minipage_hsep_#2_dim },
1040            mini-sep     .initial:n  = 0.3333em,
1041            mini-sep     .value_required:n = true,
1042            columns-sep .dim_set:c  = { l__enumext_columns_sep_#2_dim },
1043            columns-sep .value_required:n = true,
1044            columns     .int_set:c  = { l__enumext_columns_#2_int },
1045            columns     .initial:n  = 1,
1046            columns     .value_required:n = true,
1047          }
1048    }
1049 \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }
```

For `enumext*` and `keyans*` environments the situation is a bit different, the command `\miniright` is not available, so we will add the keys `mini-right` and `mini-right*` to implement support for `minipage` environment.

```
1050 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
1051    {
1052        \keys_define:nn { enumext / #1 }
1053          {
1054            mini-right  .tl_gset:c = { g__enumext_miniright_code_#2_tl },
1055            mini-right  .value_required:n = true,
1056            mini-right* .code:n    = {
1057                                      \bool_gset_true:c { g__enumext_minipage_center_#2_bool }
1058                                      \keys_set:nn { enumext / #1 } { mini-right = {##1} }
1059                                    },
1060            mini-right* .value_required:n = true,
1061          }
1062    }
1063 \clist_map_inline:nn { {enumext*}{vii}, {keyans*}{viii} } { \__enumext_tmp:nn #1 }
```

(*End of definition for* `mini-env` *and others.*)

11.21   Adjustment of vertical spaces for `multicols`

When nesting a *"list environment"* inside the `multicols` environment, the values of the *"vertical spaces"* are lost, basically the `multicols` environment takes control over them. Graphically it can be seen like in the figure 7.

To keep the desired spaces *above* and *below* in the *"list environment"* (`\topsep` + [`\partopsep`]) it is necessary to *"adjust"* the spaces added by the `multicols` environment. The most appropriate option in this case is to use a *"context sensitive"* vertical space with `\addvspace`.
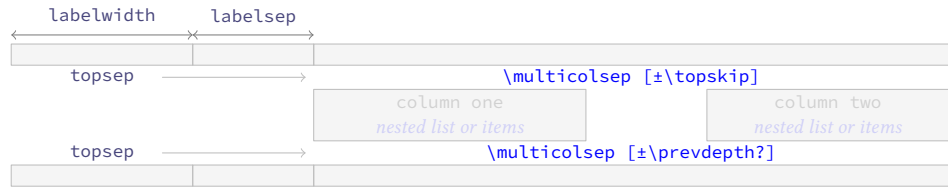
Figure 7: Representation of the vertical space in `multicols` for a nested level.

💣 I should make it clear that the implementation here is a *"bit questionable"*. At first glance doing `\multicolsep=\topsep` seemed right, but the results were not always as expected. An almost *imperceptible* detail is that in some cases the `\itemsep` values of are *"stretched"*, possibly due to the use of `\raggedcolumns` and this affects the lower space when closing the environment, which is *"smaller"* than expected. My attempts to find the correct values using `\showoutput` and `\showboxdepth` absolutely failed.

11.21.1 Adjustment of vertical spaces for `multicols` in enumext

`\__enumext_multi_set_vskip:`

The function `\__enumext_multi_set_vskip:` will take care of determining the *"adjusted spaces"* that we will apply *"above"* and *"below"* the `multicols` environment in `enumext`.

We will set the default values taking into account that TeX is in ⟨*horizontal mode*⟩, then we will make the settings for the ⟨*vertical mode*⟩ in which `\partopsep` comes into play.

Set the values of `\l__enumext_multicols_above_X_skip` and `\l__enumext_multicols_below_X_skip` equal to the value of `\topsep` in the *current level*.

```
1064 \cs_new_protected:Nn \__enumext_multi_set_vskip:
1065   {
1066     \skip_set:cn { l__enumext_multicols_above_ \__enumext_level: _skip }
1067       {
1068         \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip }
1069       }
1070     \skip_set:cn { l__enumext_multicols_below_ \__enumext_level: _skip }
1071       {
1072         \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip }
1073       }
1074     \__enumext_add_pre_parsep:
1075   }
```

(*End of definition for* `\__enumext_multi_set_vskip:`.)

`\__enumext_add_pre_parsep:`

The function `\__enumext_add_pre_parsep:` *"adjusted"* the value of `\l__enumext_multicols_above_X_skip` detecting the value of `\parsep` from the previous level. This is necessary since `\parsep` from the previous level affects the *vertical spaces*.

```
1076 \cs_new_protected:Nn \__enumext_add_pre_parsep:
1077   {
1078     \int_case:nn { \l__enumext_level_int }
1079       {
1080         { 2 }{
1081             \skip_if_eq:nnF { \l__enumext_parsep_i_skip } { \c_zero_skip }
1082               {
1083                 \skip_add:Nn \l__enumext_multicols_above_ii_skip { \l__enumext_parsep_i_skip }
1084               }
1085           }
1086         { 3 }{
1087             \skip_if_eq:nnF { \l__enumext_parsep_ii_skip } { \c_zero_skip }
1088               {
1089                 \skip_add:Nn \l__enumext_multicols_above_iii_skip { \l__enumext_parsep_ii_skip
1090               }
1091           }
1092         { 4 }{
1093             \skip_if_eq:nnF { \l__enumext_parsep_iii_skip } { \c_zero_skip }
1094               {
1095                 \skip_add:Nn \l__enumext_multicols_above_iv_skip { \l__enumext_parsep_iii_skip
1096               }
1097           }
1098       }
1099   }
```

(*End of definition for* `\__enumext_add_pre_parsep:`.)

__enumext_multi_addvspace:

The function `\__enumext_multi_addvspace:` will apply the spaces set using `\addvspace` *"above"* the `multicols` environment in `enumext`, taking into account whether TeX is in ⟨*horizontal mode*⟩ or ⟨*vertical mode*⟩.

```
1100 \cs_new_protected:Nn \__enumext_multi_addvspace:
1101   {
1102     \__enumext_multi_set_vskip:
1103     \mode_if_vertical:T
1104       {
1105         \skip_add:cn { l__enumext_multicols_above_ \__enumext_level: _skip }
1106           {
1107             \skip_use:c { l__enumext_partopsep_ \__enumext_level: _skip }
1108           }
1109         \skip_add:cn { l__enumext_multicols_below_ \__enumext_level: _skip }
1110           {
1111             \skip_use:c { l__enumext_partopsep_ \__enumext_level: _skip }
1112           }
1113       }
1114     \par\nopagebreak
1115     \addvspace{ \skip_use:c { l__enumext_multicols_above_ \__enumext_level: _skip } }
1116   }
```

(*End of definition for* `\__enumext_multi_addvspace:`.)

11.21.2 Adjustment of vertical spaces for `multicols` in `keyans`

__enumext_keyans_multi_set_vskip:
__enumext_keyans_multi_addvspace:

The function `\__enumext_keyans_multi_set_vskip:` will take care of determining the *"adjusted spaces"* that we will apply *"above"* and *"below"* the `multicols` environment in `keyans`. The implementation of this function is the same as the one used in `enumext`.

```
1117 \cs_new_protected:Nn \__enumext_keyans_multi_set_vskip:
1118   {
1119     \skip_set:Nn \l__enumext_multicols_above_v_skip
1120       {
1121         \l__enumext_topsep_v_skip
1122       }
1123     \skip_set:Nn \l__enumext_multicols_below_v_skip
1124       {
1125         \l__enumext_topsep_v_skip
1126       }
1127   }
1128 \cs_new_protected:Nn \__enumext_keyans_multi_addvspace:
1129   {
1130     \__enumext_keyans_multi_set_vskip:
1131     \mode_if_vertical:T
1132       {
1133         \skip_add:Nn \l__enumext_multicols_above_v_skip
1134           {
1135             \skip_use:N \l__enumext_partopsep_v_skip
1136           }
1137         \skip_add:Nn \l__enumext_multicols_below_v_skip
1138           {
1139             \skip_use:N \l__enumext_partopsep_v_skip
1140           }
1141       }
1142     \par\nopagebreak
1143     \addvspace{ \l__enumext_multicols_above_v_skip }
1144   }
```

(*End of definition for* `\__enumext_keyans_multi_set_vskip:` *and* `\__enumext_keyans_multi_addvspace:`.)

11.22 Adjustment of vertical spaces for `minipage`

When nesting a *"list environment"* within the `minipage` environment, the values of the *"vertical spaces"* are lost. Graphically it can be seen like in the figure 8.
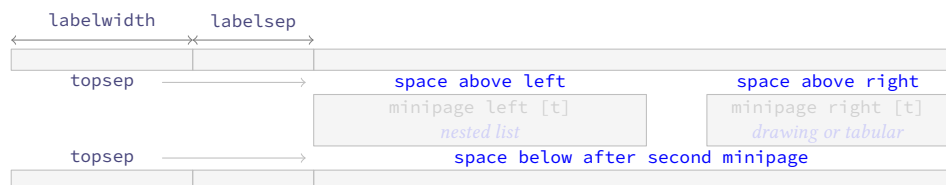
Figure 8: Representation of the `minipage` spacing adjustment for a nested level.

Since we want to keep the *"left"* and *"right"* environments *"aligned on top"*, preserving the \baselineskip and keep the desired *"spaces"* (\topsep + [\partopsep]) it is necessary to *"adjust"* the *"vertical spaces"* for minipage environments.

Here there are several complications that we must circumvent, the minipage environment eliminates the "top" spaces, the multicols environment can be nested in the minipage environment, the "top" and "bottom" spaces are affected when topsep=0pt and to this is added the \partopsep parameter that comes into action according to whether TeX is in ⟨*horizontal mode*⟩ or ⟨*vertical mode*⟩. Depending on these cases, small adjustments must be made using \vspace and \addvspace to obtain the *"desired vertical spacing"*.

💣 Again I must make clear that the implementation here is a *"bit questionable"*, but hunting the spaces (glue) produced by the minipage environment is quite complicated, even more if multicols it is nested. The setting of the values was more *"trial and error"* (aprox to \strutbox), using the help of the lua-visual-debug[14] package, again my attempts to find the correct values using \showoutput and \showboxdepth absolutely failed.

11.22.1   Adjustment of vertical spaces for minipage in enumext

__enumext_mini_set_vskip: The function __enumext_mini_set_vskip: will take care of determining the *"adjust"* spaces that we will apply *"above"* and *"below"* the __enumext_mini_env* environment in enumext.

We will set the default values taking into account that TeX is in ⟨*horizontal mode*⟩, then we will make the settings for the ⟨*vertical mode*⟩ in which \partopsep comes into play.

First determine if the multicols environment is active by comparing the value of the \l__enumext_-columns_X_int variable handled by the columns key, according to this comparison we set the adjusted values for \l__enumext_minipage_left_skip, \l__enumext_minipage_right_skip and \l__-enumext_minipage_after_skip.

```
1145  \cs_new_protected:Nn \__enumext_mini_set_vskip:
1146    {
1147      \int_compare:nNnTF
1148        { \int_use:c { l__enumext_columns_ \__enumext_level: _int } } > { 1 }
1149        {
```

If multicols environment is nested in __enumext_mini_env* environment, we will apply a correction factor to the *vertical spaces* taking into account the value of \topsep of the current level and the value of \parsep of the previous level, if these are zero we will use \strutbox as the basis for the calculations.

```
1150            \skip_if_eq:nnTF
1151              { \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip } } { \c_zero_skip }
1152              {
1153                \skip_set:Nn \l__enumext_minipage_left_skip
1154                  {
1155                    -0.150\box_dp:N \strutbox
1156                  }
1157                \skip_set:Nn \l__enumext_minipage_right_skip
1158                  {
1159                    0.695\box_dp:N \strutbox
1160                  }
1161                \skip_set:Nn \l__enumext_minipage_after_skip
1162                  {
1163                    \box_dp:N \strutbox
1164                  }
1165                \__enumext_zero_parsep:
1166              }
1167              {
1168                \skip_set:Nn \l__enumext_minipage_left_skip
1169                  {
1170                    \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip }
1171                  }
1172                \skip_set:Nn \l__enumext_minipage_right_skip
1173                  {
1174                    0.695\box_dp:N \strutbox
1175                  }
1176                \skip_set:Nn \l__enumext_minipage_after_skip
1177                  {
1178                    1.85\box_dp:N \strutbox
1179                    + \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip }
1180                  }
1181              }
1182          }
1183          {
```

If only enumext environment is nested in __enumext_mini_env* environment, we will apply a correction factor to the *vertical spaces* taking into account the value of \topsep, if this is zero we will use \strutbox as the basis for the calculations.

```
1184          \skip_if_eq:nnTF
1185            { \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip } } { \c_zero_skip }
1186            {
1187              \skip_set:Nn \l__enumext_minipage_left_skip
1188                {
1189                  0.5\box_dp:N \strutbox
1190                  - \skip_use:c { l__enumext_partopsep_ \__enumext_level: _skip }
1191                }
1192              \skip_set:Nn \l__enumext_minipage_right_skip
1193                {
1194                  \skip_use:c { l__enumext_partopsep_ \__enumext_level: _skip }
1195                }
1196              \skip_set:Nn \l__enumext_minipage_after_skip
1197                {
1198                  1.6\box_dp:N \strutbox
1199                }
1200            }
1201            {
1202              \skip_set:Nn \l__enumext_minipage_left_skip
1203                {
1204                  0.5875\box_dp:N \strutbox
1205                  - \skip_use:c { l__enumext_partopsep_ \__enumext_level: _skip }
1206                }
1207              \skip_set:Nn \l__enumext_minipage_right_skip
1208                {
1209                  + \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip }
1210                  + \skip_use:c { l__enumext_partopsep_ \__enumext_level: _skip }
1211                }
1212              \skip_set:Nn \l__enumext_minipage_after_skip
1213                {
1214                  0.325\box_dp:N \strutbox
1215                  + \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip }
1216                }
1217            }
1218          }
1219      }
```

(*End of definition for* __enumext_mini_set_vskip:.)

__enumext_zero_parsep: The function __enumext_zero_parsep: *"adjusted"* the value of \l__enumext_minipage_after_-skip detecting the value of \parsep from the previous level. This is necessary since \parsep from the previous level affects the *vertical spaces* and this is noticeable when using the nosep or noitemsep keys.

```
1220  \cs_new_protected:Nn \__enumext_zero_parsep:
1221    {
1222      \int_case:nn { \l__enumext_level_int }
1223        {
1224          { 2 }{
1225                \skip_if_eq:nnF { \l__enumext_parsep_i_skip } { \c_zero_skip }
1226                  {
1227                    \skip_add:Nn \l__enumext_minipage_after_skip { 2.15\box_dp:N \strutbox }
1228                  }
1229              }
1230          { 3 }{
1231                \skip_if_eq:nnF { \l__enumext_parsep_ii_skip } { \c_zero_skip }
1232                  {
1233                    \skip_add:Nn \l__enumext_minipage_after_skip { 2.15\box_dp:N \strutbox }
1234                  }
1235              }
1236          { 4 }{
1237                \skip_if_eq:nnF { \l__enumext_parsep_iii_skip } { \c_zero_skip }
1238                  {
1239                    \skip_add:Nn \l__enumext_minipage_after_skip { 2.15\box_dp:N \strutbox }
1240                  }
1241              }
1242        }
1243    }
```

(*End of definition for* __enumext_zero_parsep:.)

__enumext_mini_addvspace: The function __enumext_mini_addvspace: will apply the spaces set using \addvspace *"above"* the __enumext_mini_env* environment in enumext, taking into account whether TeX is in ⟨*horizontal mode*⟩

or ⟨*vertical mode*⟩. For the latter we will make some adjustments since the `\partopsep` parameter comes into play and this affects the *vertical spacing*.

```
1244  \cs_new_protected:Nn \__enumext_mini_addvspace:
1245    {
1246      \__enumext_mini_set_vskip:
1247      \mode_if_vertical:T
1248        {
1249          \skip_add:Nn \l__enumext_minipage_left_skip
1250            {
1251              \skip_use:c { l__enumext_partopsep_ \__enumext_level: _skip }
1252            }
1253          \skip_add:Nn \l__enumext_minipage_after_skip
1254            {
1255              \skip_use:c { l__enumext_partopsep_ \__enumext_level: _skip }
1256            }
1257        }
1258      \par\nopagebreak
1259      \addvspace { \l__enumext_minipage_left_skip }
1260    }
```

(*End of definition for* `\__enumext_mini_addvspace:`.)

11.22.2 Adjustment of vertical spaces for `minipage` in `keyans`

`\__enumext_keyans_mini_set_vskip:` The function `\__enumext_keyans_mini_set_vskip:` will take care of determining the "adjusted" spaces that we will apply "*above*" and "*below*" the `__enumext_mini_env*` environment in `keyans`. The implementation of this function is the same as the one used in `enumext`.

```
1261  \cs_new_protected:Nn \__enumext_keyans_mini_set_vskip:
1262    {
1263      \skip_zero_new:N \l__enumext_minipage_after_skip
1264      \skip_zero_new:N \l__enumext_minipage_left_skip
1265      \skip_zero_new:N \l__enumext_minipage_right_skip
1266      \int_compare:nNnTF { \l__enumext_columns_v_int } > { 1 }
1267        {
1268          \skip_if_eq:nnTF { \l__enumext_topsep_v_skip } { \c_zero_skip }
1269            {
1270              \skip_set:Nn \l__enumext_minipage_left_skip { -0.25\box_dp:N \strutbox }
1271              \skip_set:Nn \l__enumext_minipage_right_skip { 0.705\box_dp:N \strutbox }
1272              \skip_set:Nn \l__enumext_minipage_after_skip { \box_dp:N \strutbox }
1273              \skip_if_eq:nnF { \l__enumext_parsep_i_skip } { \c_zero_skip }
1274                {
1275                  \skip_add:Nn \l__enumext_minipage_after_skip { 2.15\box_dp:N \strutbox }
1276                }
1277            }
1278            {
1279              \skip_set:Nn \l__enumext_minipage_left_skip
1280                {
1281                  \skip_use:N \l__enumext_topsep_v_skip
1282                }
1283              \skip_set:Nn \l__enumext_minipage_right_skip
1284                {
1285                  0.705\box_dp:N \strutbox
1286                }
1287              \skip_set:Nn \l__enumext_minipage_after_skip
1288                {
1289                  1.85\box_dp:N \strutbox + \l__enumext_topsep_v_skip
1290                }
1291            }
1292        }
1293        {
1294          \skip_if_eq:nnTF { \l__enumext_topsep_v_skip } { \c_zero_skip }
1295            {
1296              \skip_set:Nn \l__enumext_minipage_left_skip
1297                {
1298                  0.5\box_dp:N \strutbox
1299                  + \l__enumext_partopsep_v_skip
1300                }
1301              \skip_set:Nn \l__enumext_minipage_right_skip
1302                {
1303                  \l__enumext_partopsep_v_skip
1304                }
```

```
1305          \skip_set:Nn \l__enumext_minipage_after_skip { 1.6\box_dp:N \strutbox }
1306        }
1307      {
1308        \skip_set:Nn \l__enumext_minipage_left_skip
1309          {
1310            0.5875\box_dp:N \strutbox - \l__enumext_partopsep_v_skip
1311          }
1312        \skip_set:Nn \l__enumext_minipage_right_skip
1313          {
1314            \l__enumext_topsep_v_skip + \l__enumext_partopsep_v_skip
1315          }
1316        \skip_set:Nn \l__enumext_minipage_after_skip
1317          {
1318            0.325\box_dp:N \strutbox + \l__enumext_topsep_v_skip
1319          }
1320      }
1321    }
1322  }
```

(*End of definition for* `\__enumext_keyans_mini_set_vskip:`.)

`\__enumext_keyans_mini_addvspace:`

The function `\__enumext_keyans_mini_addvspace:` will apply the spaces set using `\addvspace` *"above"* the `__enumext_mini_env*` environment in `keyans`, taking into account whether TeX is in ⟨*horizontal mode*⟩ or ⟨*vertical mode*⟩. For the latter we will make some adjustments since the `\partopsep` parameter comes into play and this affects the *vertical spacing*. The implementation of this function is the same as the one used in `enumext`.

```
1323  \cs_new_protected:Nn \__enumext_keyans_mini_addvspace:
1324    {
1325      \__enumext_keyans_mini_set_vskip:
1326      \mode_if_vertical:T
1327        {
1328          \skip_add:Nn \l__enumext_minipage_left_skip
1329            {
1330              \l__enumext_partopsep_v_skip
1331            }
1332          \skip_add:Nn \l__enumext_minipage_after_skip
1333            {
1334              \l__enumext_partopsep_v_skip
1335            }
1336        }
1337      \par\nopagebreak
1338      \addvspace { \l__enumext_minipage_left_skip }
1339    }
```

(*End of definition for* `\__enumext_keyans_mini_addvspace:`.)

11.22.3 Adjustment of vertical spaces for `minipage` in `enumext*` and `keyans*`

`\__enumext_mini_set_vskip_vii:`
`\__enumext_mini_set_vskip_viii:`

The functions `\__enumext_mini_set_vskip_vii:` and `\__enumext_mini_set_vskip_viii:` will take care of determining the *"adjusted"* spaces that we will apply *"above"* and *"below"* the `__enumext_-mini_env*` environment in `enumext*` and `keyans*`.

```
1340  \cs_new_protected:Nn \__enumext_mini_set_vskip_vii:
1341    {
1342      \skip_zero_new:N \l__enumext_minipage_left_skip
1343      \skip_gzero_new:N \g__enumext_minipage_right_skip
1344      \skip_gzero_new:N \g__enumext_minipage_after_skip
1345      \skip_if_eq:nnTF { \l__enumext_topsep_vii_skip } { \c_zero_skip }
1346        {
1347          \skip_set:Nn \l__enumext_minipage_left_skip { 0.5\box_dp:N \strutbox }
1348          \skip_gset:Nn \g__enumext_minipage_right_skip { 0.325\box_dp:N \strutbox }
1349        }
1350        {
1351          \skip_set:Nn \l__enumext_minipage_left_skip { 0.5875\box_dp:N \strutbox }
1352          \skip_gset:Nn \g__enumext_minipage_right_skip
1353            {
1354              \l__enumext_topsep_vii_skip
1355            }
1356          \skip_gset:Nn \g__enumext_minipage_after_skip
1357            {
1358              0.325\box_dp:N \strutbox + \l__enumext_topsep_vii_skip
1359            }
```

```
1360              }
1361        }
1362    \cs_new_protected:Nn \__enumext_mini_set_vskip_viii:
1363      {
1364        \skip_zero_new:N \l__enumext_minipage_after_skip
1365        \skip_zero_new:N \l__enumext_minipage_left_skip
1366        \skip_zero_new:N \l__enumext_minipage_right_skip
1367        \skip_if_eq:nnTF { \l__enumext_topsep_viii_skip } { \c_zero_skip }
1368          {
1369            \skip_set:Nn \l__enumext_minipage_left_skip
1370              {
1371                0.5\box_dp:N \strutbox
1372              }
1373            \skip_set:Nn \l__enumext_minipage_right_skip
1374              {
1375                \l__enumext_partopsep_viii_skip
1376              }
1377            \skip_set:Nn \l__enumext_minipage_after_skip
1378              {
1379                1.6\box_dp:N \strutbox
1380              }
1381          }
1382          {
1383            \skip_set:Nn \l__enumext_minipage_left_skip
1384              {
1385                0.5875\box_dp:N \strutbox
1386              }
1387            \skip_set:Nn \l__enumext_minipage_right_skip
1388              {
1389                \l__enumext_topsep_viii_skip
1390              }
1391            \skip_set:Nn \l__enumext_minipage_after_skip
1392              {
1393                0.325\box_dp:N \strutbox + \l__enumext_topsep_viii_skip
1394              }
1395          }
1396      }
```

(*End of definition for* __enumext_mini_set_vskip_vii: *and* __enumext_mini_set_vskip_viii:.)

__enumext_mini_addvspace_vii:
__enumext_mini_addvspace_viii:

The functions __enumext_mini_addvspace_vii: and __enumext_mini_addvspace_viii: will apply the vertical space *"only above"* the __enumext_mini_env* environment on the *left side* when the mini-right key is active in the enumext* and keyans* environments.

Here we will NOT take into account whether TeX is in ⟨*horizontal mode*⟩ or ⟨*vertical mode*⟩, since \partopsep is equal to 0pt in both environments.

```
1397    \cs_new_protected:Nn \__enumext_mini_addvspace_vii:
1398      {
1399        \__enumext_mini_set_vskip_vii:
1400        \par\nopagebreak
1401        \addvspace { \l__enumext_minipage_left_skip }
1402      }
1403    \cs_new_protected:Nn \__enumext_mini_addvspace_viii:
1404      {
1405        \__enumext_mini_set_vskip_viii:
1406        \par\nopagebreak
1407        \addvspace { \l__enumext_minipage_left_skip }
1408      }
```

(*End of definition for* __enumext_mini_addvspace_vii: *and* __enumext_mini_addvspace_viii:.)

11.22.4 The command \miniright

The command \miniright will close the __enumext_mini_env* environment on the *"left side"*, open the __enumext_mini_env* environment on the *"right side"* adding the *adjusted vertical space*. By default we will add \centering when starting the *"right side"* environment. The *starred argument* '*' inhibits the use of \centering command i.e. the usual LaTeX justification is maintained in the __enumext_mini_env* on the *"right side"*.

\miniright   First we will perform some checks to prevent the command from being executed outside the enumext environment or somewhere inappropriate then we will call the internal functions to execute it in the enumext and keyans environments.

```
1409  \NewDocumentCommand \miniright { s }
1410    {
1411      \int_compare:nNnT { \l__enumext_keyans_pic_level_int } = { 1 }
1412        {
1413          \msg_error:nnn { enumext } { wrong-miniright-place }
1414        }
1415      % outside
1416      \bool_lazy_and:nnT
1417        { \int_compare_p:nNn { \l__enumext_level_int } = { 0 } }
1418        { \int_compare_p:nNn { \l__enumext_level_h_int } = { 0 } }
1419        {
1420          \msg_error:nnn { enumext } { wrong-miniright-place }
1421        }
1422      % starred env
1423      \bool_if:NT \l__enumext_starred_bool
1424        {
1425          \msg_error:nnn { enumext } { wrong-miniright-starred }
1426        }
1427      \int_compare:nNnTF { \l__enumext_keyans_level_int } = { 1 }
1428        {
1429          \__enumext_keyans_mini_right_cmd:n {#1}
1430        }
1431        { \__enumext_mini_right_cmd:n {#1} }
1432    }
```

(*End of definition for* \miniright*. This function is documented on page* 10*.*)

__enumext_mini_right_cmd:n The function __enumext_mini_right_cmd:n takes as argument the *starred* '*' of the \miniright command in the enumext environment. We check if the mini-env key is active via the variable \l__enumext_minipage_right_X_dim, if so we close the multicols environment with the __enumext_mini_env* environment on the *"left side"*, then we open the __enumext_mini_env* environment on the *"right side"*, apply our adjusted *"vertical spaces"*, followed by adding the \centering command when the starred argument '*' is not present and set zero \g__enumext_minipage_stat_int, otherwise we return an error.

```
1433  \cs_new_protected:Npn \__enumext_mini_right_cmd:n #1
1434    {
1435      \dim_compare:nNnTF
1436        { \dim_use:c { l__enumext_minipage_right_ \__enumext_level: _dim } } > { \c_zero_dim }
1437        {
1438          \__enumext_multicols_stop:
1439          \end{__enumext_mini_env*}
1440          \hfill
1441          \begin{__enumext_mini_env*}
1442            { \dim_use:c { l__enumext_minipage_right_ \__enumext_level: _dim } }
1443          \par\addvspace { \l__enumext_minipage_right_skip }
1444          \bool_if:nF {#1}
1445            {
1446              \centering
1447            }
1448          \int_gzero:N \g__enumext_minipage_stat_int
1449        }
1450        { \msg_error:nnn { enumext } { wrong-miniright-use } }
1451      % paranoia
1452      \RenewDocumentCommand \miniright { s }
1453        {
1454          \msg_error:nn { enumext } { many-miniright-used }
1455        }
1456    }
```

(*End of definition for* __enumext_mini_right_cmd:n*.*)

__enumext_keyans_mini_right_cmd:n The function __enumext_keyans_mini_right_cmd:n takes as argument the *starred* '*' of the \miniright command in the keyans environment. The implementation of this function is the same as that of the __enumext_mini_right_cmd:n function of the enumext environment.

```
1457  \cs_new_protected:Npn \__enumext_keyans_mini_right_cmd:n #1
1458    {
1459      \dim_compare:nNnTF { \l__enumext_minipage_right_v_dim } > { \c_zero_dim }
1460        {
1461          \__enumext_keyans_multicols_stop:
1462          \end{__enumext_mini_env*}
1463          \hfill
```

```
1464        \begin{__enumext_mini_env*}{ \l__enumext_minipage_right_v_dim }
1465          \par\addvspace { \l__enumext_minipage_right_skip }
1466          \bool_if:nF {#1}
1467            {
1468              \centering
1469            }
1470          \int_gzero:N \g__enumext_minipage_stat_int
1471      }
1472    { \msg_error:nnn { enumext } { wrong-miniright-use } }
1473    \RenewDocumentCommand \miniright { s }
1474      {
1475        \msg_error:nn { enumext } { many-miniright-used }
1476      }
1477  }
```

(*End of definition for* __enumext_keyans_mini_right_cmd:n.)

11.23 Setting above and below keys

While having controlled the *vertical spaces* within the enumext and keyans environments when using the columns or mini-env keys, sometimes the *"vertical spaces above"* or *"vertical spaces below"* the environments are not as expected and it is necessary to be able to apply a *"fine correction"* to these. As I have not been able to correct these *glitches*, the best option is to leave a couple of ⟨keys⟩ dedicated to this purpose, in this case it is best to use \vspace or \vspace* when convenient.

above
above*
below
below*

Define above, above*, below and below* keys for enumext and keyans environments.

```
1478  \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
1479    {
1480      \keys_define:nn { enumext / #1 }
1481        {
1482          above  .skip_set:c = { l__enumext_vspace_above_#2_skip },
1483          above  .value_required:n = true,
1484          above* .code:n      = \bool_set_true:c { l__enumext_vspace_a_star_#2_bool }
1485                                \keys_set:nn { enumext / #1 } { above = {##1} },
1486          above* .value_required:n = true,
1487          below  .skip_set:c = { l__enumext_vspace_below_#2_skip },
1488          below  .value_required:n = true,
1489          below* .code:n      = \bool_set_true:c { l__enumext_vspace_b_star_#2_bool }
1490                                \keys_set:nn { enumext / #1 } { below = {##1} },
1491          below* .value_required:n = true,
1492        }
1493    }
1494  \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }
```

(*End of definition for above and others.*)

11.23.1 Functions for above and below keys in enumext

__enumext_vspace_above:

The function __enumext_vspace_above: apply the *vertical space above* the enumext environment set by the above* and above keys.

```
1495  \cs_new_protected:Nn \__enumext_vspace_above:
1496    {
1497      \skip_if_eq:nnF
1498        { \skip_use:c { l__enumext_vspace_above_ \__enumext_level: _skip } } { \c_zero_skip }
1499        {
1500          \bool_if:cTF { l__enumext_vspace_a_star_ \__enumext_level: _bool }
1501            {
1502              \vspace*{ \skip_use:c { l__enumext_vspace_above_ \__enumext_level: _skip } }
1503            }
1504            {
1505              \vspace { \skip_use:c { l__enumext_vspace_above_ \__enumext_level: _skip } }
1506            }
1507        }
1508    }
```

(*End of definition for* __enumext_vspace_above:.)

__enumext_vspace_below:

The function __enumext_vspace_below: apply the *vertical space below* the enumext environment set by the below* and below keys.

```
1509  \cs_new_protected:Nn \__enumext_vspace_below:
1510    {
1511      \skip_if_eq:nnF
```

```
1512     { \skip_use:c { l__enumext_vspace_below_ \__enumext_level: _skip } } { \c_zero_skip }
1513     {
1514       \bool_if:cTF { l__enumext_vspace_b_star_ \__enumext_level: _bool }
1515         {
1516           \vspace*{ \skip_use:c { l__enumext_vspace_below_ \__enumext_level: _skip } }
1517         }
1518         {
1519           \vspace { \skip_use:c { l__enumext_vspace_below_ \__enumext_level: _skip } }
1520         }
1521     }
1522   }
```

(*End of definition for* __enumext_vspace_below:.)

11.23.2   Functions for above and below keys in keyans

__enumext_vspace_above_v: The function __enumext_vspace_above_v: apply the *vertical space above* the keyans environment set by the above and above* keys.

```
1523 \cs_new_protected:Nn \__enumext_vspace_above_v:
1524   {
1525     \skip_if_eq:nnF { \l__enumext_vspace_above_v_skip } { \c_zero_skip }
1526       {
1527         \bool_if:NTF \l__enumext_vspace_a_star_v_bool
1528           {
1529             \vspace*{ \l__enumext_vspace_above_v_skip }
1530           }
1531           { \vspace { \l__enumext_vspace_above_v_skip } }
1532       }
1533   }
```

(*End of definition for* __enumext_vspace_above_v:.)

__enumext_vspace_below_v: The function __enumext_vspace_below_v: apply the *vertical space below* the keyans environment set by the below* and below keys.

```
1534 \cs_new_protected:Nn \__enumext_vspace_below_v:
1535   {
1536     \skip_if_eq:nnF { \l__enumext_vspace_below_v_skip } { \c_zero_skip }
1537       {
1538         \bool_if:NTF \l__enumext_vspace_b_star_v_bool
1539           {
1540             \vspace*{ \l__enumext_vspace_below_v_skip }
1541           }
1542           { \vspace { \l__enumext_vspace_below_v_skip } }
1543       }
1544   }
```

(*End of definition for* __enumext_vspace_below_v:.)

11.23.3   Functions for above and below keys in enumext* keyans*

__enumext_vspace_above_vii: The functions __enumext_vspace_above_vii: and __enumext_vspace_above_viii: apply the
__enumext_vspace_above_viii: *vertical space above* the enumext* and keyans* environments set by the above and above* keys.

```
1545 \cs_new_protected:Nn \__enumext_vspace_above_vii:
1546   {
1547     \skip_if_eq:nnF { \l__enumext_vspace_above_vii_skip } { \c_zero_skip }
1548       {
1549         \bool_if:NTF \l__enumext_vspace_a_star_vii_bool
1550           {
1551             \vspace*{ \l__enumext_vspace_above_vii_skip }
1552           }
1553           { \vspace { \l__enumext_vspace_above_vii_skip } }
1554       }
1555   }
1556 \cs_new_protected:Nn \__enumext_vspace_above_viii:
1557   {
1558     \skip_if_eq:nnF { \l__enumext_vspace_above_viii_skip } { \c_zero_skip }
1559       {
1560         \bool_if:NTF \l__enumext_vspace_a_star_viii_bool
1561           {
1562             \vspace*{ \l__enumext_vspace_above_viii_skip }
1563           }
1564           { \vspace { \l__enumext_vspace_above_viii_skip } }
1565       }
1566   }
```

(*End of definition for __enumext_vspace_above_vii: and __enumext_vspace_above_viii:.*)

__enumext_vspace_below_vii: The functions __enumext_vspace_below_vii: and __enumext_vspace_below_viii: apply the
__enumext_vspace_below_viii: *vertical space below* the enumext* and keyans* environments set by the below* and below keys.

```
1567 \cs_new_protected:Nn \__enumext_vspace_below_vii:
1568   {
1569     \skip_if_eq:nnF { \l__enumext_vspace_below_vii_skip } { \c_zero_skip }
1570       {
1571         \bool_if:NTF \l__enumext_vspace_b_star_vii_bool
1572           {
1573             \vspace*{ \l__enumext_vspace_below_vii_skip }
1574           }
1575           { \vspace { \l__enumext_vspace_below_vii_skip } }
1576       }
1577   }
1578 \cs_new_protected:Nn \__enumext_vspace_below_viii:
1579   {
1580     \skip_if_eq:nnF { \l__enumext_vspace_below_viii_skip } { \c_zero_skip }
1581       {
1582         \bool_if:NTF \l__enumext_vspace_b_star_viii_bool
1583           {
1584             \vspace*{ \l__enumext_vspace_below_viii_skip }
1585           }
1586           { \vspace { \l__enumext_vspace_below_viii_skip } }
1587       }
1588   }
```

(*End of definition for __enumext_vspace_below_vii: and __enumext_vspace_below_viii:.*)

11.24 Setting series, resume and resume* keys

The series key is responsible for the whole process of the resume and resume* keys. The idea behind this is to be able to absorb the ⟨*keys*⟩ passed to the optional argument of the *"first level"* of the environments enumext and enumext*, but, discarding some specific ⟨*keys*⟩. This implementation is adapted directly from the code provided by Jonathan P. Spratte (@Skillmon) in chat-TeX-SX

series   We define the keys series, resume and resume* only for the *"first level"* of enumext and enumext*.
resume
resume*
```
1589 \cs_set_protected:Npn \__enumext_tmp:n #1
1590   {
1591     \keys_define:nn { enumext / #1 }
1592       {
1593         series  .str_set:N = \l__enumext_series_str,
1594         series  .value_required:n = true,
1595         resume  .code:n = \__enumext_resume_series:n {##1},
1596         resume* .code:n = \__enumext_resume_starred:,
1597         resume* .value_forbidden:n = true,
1598       }
1599   }
1600 \clist_map_inline:nn { level-1, enumext* } { \__enumext_tmp:n {#1} }
```

(*End of definition for series, resume, and resume*.*)

11.24.1 Internal functions for series key

__enumext_filter_series:n   The function __enumext_filter_series:n will be in charge of filtering the ⟨*keys*⟩ we want to store
__enumext_filter_series_key:n   where {#1} represents the optional value passed to the environment.
__enumext_filter_series_pair:nn
```
1601 \cs_new:Npn \__enumext_filter_series:n #1
1602   {
1603     \use:e
1604       {
1605         \keyval_parse:NNn
1606           \__enumext_filter_series_key:n
1607           \__enumext_filter_series_pair:nn {#1}
1608       }
1609   }
```

The function __enumext_filter_series_key:n will be responsible for filtering the ⟨*keys*⟩ that are passed *"without value"* by excluding the resume, resume* and base-fix keys.

```
1610 \cs_new:Npn \__enumext_filter_series_key:n #1
1611   {
1612     \str_case:nnF {#1}
1613       {
1614         { resume } {} { resume* } {} { base-fix } {}
```

```
1615            }
1616            { , { \exp_not:n {#1} } }
1617      }
```

The function `\__enumext_filter_series_pair:nn` will be responsible for filtering the ⟨*keys*⟩ that are passed *"with value"* by excluding the series, resume, start, start*, save-ans and save-key keys.

```
1618  \cs_new:Npn \__enumext_filter_series_pair:nn #1#2
1619    {
1620      \str_case:nnF {#1}
1621        {
1622          { series } {} { resume } {} { start } {}
1623          { start* } {}  { save-ans } {} { save-key } {}
1624        }
1625        { , { \exp_not:n {#1} } = { \exp_not:n {#2} } }
1626    }
```

(*End of definition for* `\__enumext_filter_series:n`, `\__enumext_filter_series_key:n`, *and* `\__enumext_filter_series_pair:nn`.)

`\__enumext_parse_series:n`
`\__enumext_resume_last:n`

The function `\__enumext_parse_series:n` will be responsible for storing the filtered ⟨*keys*⟩ in the global variable `\g__enumext_series_`⟨*series name*⟩`_tl` along with the creation of the integer variable `\g__enumext_series_`⟨*series name*⟩`_int` when the key is passed as an argument; otherwise, it will check the state of the boolean variable `\l__enumext_resume_active_bool` set by the keys resume and resume* and will call the function `\__enumext_resume_last:n`.

💣 The value of boolean variable `\l__enumext_resume_active_bool` is set to true by the function `\__enumext_resume_counter:n` which is used by the keys resume and resume*, in this case we must Make sure it is set to false so that it does not overwrite the default filtered ⟨*keys*⟩. This function is passed to the function `\__enumext_parse_keys:n` in the enumext environment definition (§11.38) and to the function `\__enumext_parse_keys_vii:n` in the enumext* environment definition (§11.43).

```
1627  \cs_new_protected:Npn \__enumext_parse_series:n #1
1628    {
1629      \str_if_empty:NTF \l__enumext_series_str
1630        {
1631          \bool_if:NF \l__enumext_resume_active_bool
1632            {
1633              \__enumext_resume_last:n {#1}
1634            }
1635        }
1636        {
1637          \tl_gclear_new:c { g__enumext_series_ \l__enumext_series_str _tl }
1638          \tl_gset:ce { g__enumext_series_ \l__enumext_series_str _tl }
1639            { \__enumext_filter_series:n {#1} }
1640          \int_if_exist:cF { g__enumext_series_ \l__enumext_series_str _int }
1641            {
1642              \int_new:c { g__enumext_series_ \l__enumext_series_str _int }
1643            }
1644        }
1645    }
```

The function `\__enumext_resume_last:n` will be in charge of saving the filtering ⟨*keys*⟩ when the series key is *not used* and will save them in the variable `\g__enumext_standar_series_tl` for the enumext environment and in the variable `\g__enumext_starred_series_tl` for the enumext* environment. Here we must use `\bool_lazy_all:nT` to make sure that the default values are not overwritten when the environment is nested and the series key is not being used.

```
1646  \cs_new_protected:Npn \__enumext_resume_last:n #1
1647    {
1648      \bool_if:NT \l__enumext_standar_first_bool
1649        {
1650          \tl_gclear:N \g__enumext_standar_series_tl
1651          \tl_gset:Ne \g__enumext_standar_series_tl { \__enumext_filter_series:n {#1} }
1652        }
1653      \bool_if:NT \l__enumext_starred_first_bool
1654        {
1655          \tl_gclear:N \g__enumext_starred_series_tl
1656          \tl_gset:Ne \g__enumext_starred_series_tl { \__enumext_filter_series:n {#1} }
1657        }
1658    }
```

(*End of definition for* `\__enumext_parse_series:n` *and* `\__enumext_resume_last:n`.)

11.24.2 Internal function to save counter value

__enumext_resume_save_counter: The __enumext_resume_save_counter: function will save the last counter value to \g__enumext_-series_⟨series name⟩_int if the series={⟨series name⟩} key has been passed, to \g__enumext_-resume_int if it has passed the key resume *without value* and the key series is not active, in \g__-enumext_series_⟨series name⟩_int if the key resume={⟨series name⟩} has been passed and in \g__-enumext_series_⟨store name⟩_int if the key has been passed save-ans={⟨store name⟩}.

💣 The variables \l__enumext_series_str and \l__enumext__resume_name_tl contain the same {⟨series name⟩} but are executed at different moments, the integer variable with \l__enumext_series_str sets the value when execute series={⟨series name⟩} and the integer variable with \l__enumext__resume_name_tl sets the subsequent values when use resume={⟨series name⟩}. This function is passed to the enumext environment definition (§11.38) and the enumext* environment definition (§11.43).

```
1659  \cs_new_protected:Nn \__enumext_resume_save_counter:
1660    {
1661      \bool_if:NT \g__enumext_standar_bool
1662        {
1663          \tl_if_empty:NF \l__enumext_series_str
1664            {
1665              \int_gset_eq:cN
1666                { g__enumext_series_ \l__enumext_series_str _int } \value{enumXi}
1667            }
1668          \tl_if_empty:NTF \l__enumext_resume_name_tl
1669            {
1670              \str_if_empty:NT \l__enumext_series_str
1671                {
1672                  \int_gset_eq:NN \g__enumext_resume_int \value{enumXi}
1673                }
1674            }
1675            {
1676              \int_if_exist:cT { g__enumext_series_ \l__enumext_resume_name_tl _int }
1677                {
1678                  \int_gset_eq:cN
1679                    { g__enumext_series_ \l__enumext_resume_name_tl _int } \value{enumXi}
1680                }
1681            }
1682          \int_if_exist:cT { g__enumext_resume_ \l__enumext_store_name_tl _int }
1683            {
1684              \int_gset_eq:cN
1685                { g__enumext_resume_ \l__enumext_store_name_tl _int } \value{enumXi}
1686            }
1687        }
1688      \bool_if:NT \g__enumext_starred_bool
1689        {
1690          \tl_if_empty:NF \l__enumext_series_str
1691            {
1692              \int_gset_eq:cN
1693                { g__enumext_series_ \l__enumext_series_str _int } \value{enumXvii}
1694            }
1695          \tl_if_empty:NTF \l__enumext_resume_name_tl
1696            {
1697              \str_if_empty:NT \l__enumext_series_str
1698                {
1699                  \int_gset_eq:NN \g__enumext_resume_vii_int \value{enumXvii}
1700                }
1701            }
1702            {
1703              \int_if_exist:cT { g__enumext_series_ \l__enumext_resume_name_tl _int }
1704                {
1705                  \int_gset_eq:cN
1706                    { g__enumext_series_ \l__enumext_resume_name_tl _int } \value{enumXvii}
1707                }
1708            }
1709          \int_if_exist:cT { g__enumext_resume_ \l__enumext_store_name_tl _int }
1710            {
1711              \int_gset_eq:cN
1712                { g__enumext_resume_ \l__enumext_store_name_tl _int } \value{enumXvii}
1713            }
1714        }
1715    }
```

(*End of definition for* __enumext_resume_save_counter:.)

11.24.3 Internal functions for resume key

__enumext_resume_series:n

The function `\__enumext_resume_series:n` will handle the argument passed to the resume key in enumext and enumext* environments. If the key is passed *without value* the function `\__enumext_-resume_counter:` is executed which will set the counter according to the numbering of the last enumext or enumext* environments in which `series={⟨series name⟩}` key is not present, if the save-ans key is active it will set the counter according to the value of the integer variable created by that key, otherwise it will verify that the `\g__enumext_series_⟨series name⟩_tl` variable set by the series key exists, if so it will pass these keys to the *first level* of the environment, otherwise it will return an error.

```
1716 \cs_new_protected:Npn \__enumext_resume_series:n #1
1717   {
1718     \tl_if_empty:nTF {#1}
1719       {
1720         \__enumext_resume_counter:n { }
1721       }
1722       {
1723         \tl_if_exist:cTF { g__enumext_series_ \tl_to_str:n {#1} _tl }
1724           {
1725             \__enumext_resume_counter:n {#1}
1726             \bool_if:NT \g__enumext_standar_bool
1727               {
1728                 \keys_set:nv { enumext / level-1 }
1729                   { g__enumext_series_ \tl_to_str:n {#1} _tl }
1730               }
1731             \bool_if:NT \g__enumext_starred_bool
1732               {
1733                 \keys_set:nv { enumext / enumext* }
1734                   { g__enumext_series_ \tl_to_str:n {#1} _tl }
1735               }
1736           }
1737           {
1738             \bool_if:NT \g__enumext_standar_bool
1739               {
1740                 \msg_error:nnn { enumext } { unknown-series } {#1}
1741               }
1742             \bool_if:NT \g__enumext_starred_bool
1743               {
1744                 \msg_error:nnn { enumext } { unknown-series } {#1}
1745               }
1746           }
1747       }
1748   }
```

(*End of definition for* `\__enumext_resume_series:n`.)

__enumext_resume_counter:n
__enumext_resume_counter:
__enumext_resume_counter_series:
__enumext_resume_counter_save_ans:

The function `\__enumext_resume_counter:n` will set the variable `\l__enumext_resume_active_-bool` to true and pass the value of the key resume to the variable `\l__enumext_series_name_tl` which will contain the `{⟨series name⟩}`. If the variable `\l__enumext_series_name_tl` is empty, that is, we are passing the key resume *without value*, we will execute the function `\__enumext_resume_counter:` otherwise, when we pass `resume={⟨series name⟩}` we will execute the function `\__enumext_resume_-counter_series:`, finally we will execute the function `\__enumext_resume_counter_save_ans:` which is associated with the key save-ans.

```
1749 \cs_new_protected:Npn \__enumext_resume_counter:n #1
1750   {
1751     \bool_set_true:N \l__enumext_resume_active_bool
1752     \tl_set:Nn \l__enumext_resume_name_tl {#1}
1753     \tl_if_empty:NTF \l__enumext_resume_name_tl
1754       {
1755         \__enumext_resume_counter:
1756       }
1757       {
1758         \__enumext_resume_counter_series:
1759       }
1760     \__enumext_resume_counter_save_ans:
1761   }
```

The `\__enumext_resume_counter:` function is executed when the resume key is used *without value*, only the counters for the *"first level"* of the environments will be set.

```
1762 \cs_new_protected:Nn \__enumext_resume_counter:
1763   {
1764     \bool_if:NT \g__enumext_standar_bool
```

```
1765              {
1766                  \int_gincr:N \g__enumext_resume_int
1767                  \int_set_eq:NN \l__enumext_start_i_int \g__enumext_resume_int
1768              }
1769          \bool_if:NT \g__enumext_starred_bool
1770              {
1771                  \int_gincr:N \g__enumext_resume_vii_int
1772                  \int_set_eq:NN \l__enumext_start_vii_int \g__enumext_resume_vii_int
1773              }
1774      }
```

The function __enumext_resume_counter_series: will be executed when the resume={⟨series name⟩} key is active, setting the counters for the *"first level"* of the environments according to the value of the integer variables created by the series key.

```
1775  \cs_new_protected:Nn \__enumext_resume_counter_series:
1776      {
1777          \bool_if:NT \g__enumext_standar_bool
1778              {
1779                  \int_set:Nn \l__enumext_start_i_int
1780                      {
1781                          \int_use:c { g__enumext_series_ \l__enumext_resume_name_tl _int } + 1
1782                      }
1783              }
1784          \bool_if:NT \g__enumext_starred_bool
1785              {
1786                  \int_set:Nn \l__enumext_start_vii_int
1787                      {
1788                          \int_use:c { g__enumext_series_ \l__enumext_resume_name_tl _int } + 1
1789                      }
1790              }
1791      }
```

The function __enumext_resume_counter_save_ans: will be executed when the save-ans key is active along with the resume key, setting the counters for the *"first level"* of the environments according to the value of the integer variables created by the save-ans key.

```
1792  \cs_new_protected:Nn \__enumext_resume_counter_save_ans:
1793      {
1794          \bool_lazy_and:nnT
1795              { \bool_if_p:N \l__enumext_standar_first_bool }
1796              { \bool_if_p:N \l__enumext_store_active_bool }
1797              {
1798                  \int_set:Nn \l__enumext_start_i_int
1799                      {
1800                          \int_use:c { g__enumext_resume_ \l__enumext_store_name_tl _int } + 1
1801                      }
1802              }
1803          \bool_lazy_and:nnT
1804              { \bool_if_p:N \l__enumext_starred_first_bool }
1805              { \bool_if_p:N \l__enumext_store_active_bool }
1806              {
1807                  \int_set:Nn \l__enumext_start_vii_int
1808                      {
1809                          \int_use:c { g__enumext_resume_ \l__enumext_store_name_tl _int } + 1
1810                      }
1811              }
1812      }
```

(*End of definition for* __enumext_resume_counter:n *and others.*)

11.24.4   Internal function for resume* key

__enumext_resume_starred: The function __enumext_resume_starred: will handle the resume* key in the enumext and enumext* environments. This function will execute the filtered ⟨keys⟩ in the last one and will continue with the numbering according to the last execution of the environment enumext or enumext* in which the keys resume={⟨series name⟩} or series={⟨series name⟩} were not active.

```
1813  \cs_new_protected:Nn \__enumext_resume_starred:
1814      {
1815          \bool_if:NT \g__enumext_standar_bool
1816              {
1817                  \tl_if_empty:NF \g__enumext_standar_series_tl
1818                      {
1819                          \__enumext_resume_counter:n { }
```

```
1820              \keys_set:nV { enumext / level-1 } \g__enumext_standar_series_tl
1821            }
1822        }
1823    \bool_if:NT \g__enumext_starred_bool
1824      {
1825        \tl_if_empty:NF \g__enumext_starred_series_tl
1826          {
1827            \__enumext_resume_counter:n { }
1828            \keys_set:nV { enumext / enumext* } \g__enumext_starred_series_tl
1829          }
1830      }
1831    }
```

(*End of definition for* `\__enumext_resume_starred:`.)

11.25   Setting save-ans, check-ans and no-store keys

The key save-ans is directly associated with the keys check-ans, no-store, resume and resume*, this will activate the entire *"storage system"* in the enumext package.

11.25.1   Setting save-ans key

save-ans   We define the keys save-ans only for the *"first level"* of enumext and enumext*.

```
1832 \cs_set_protected:Npn \__enumext_tmp:n #1
1833   {
1834     \keys_define:nn { enumext / #1 }
1835       {
1836         save-ans .code:n = \__enumext_storing_set:n {##1},
1837         save-ans .value_required:n = true,
1838       }
1839   }
1840 \clist_map_inline:nn { level-1, enumext* } { \__enumext_tmp:n {#1} }
```

(*End of definition for* save-ans.)

11.25.2   Internal functions for save-ans key

__enumext_start_save_ans_msg:
__enumext_stop_save_ans_msg:

The functions __enumext_start_save_ans_msg: and __enumext_stop_save_ans_msg: will display in the terminal and .log file the environment in which the save-ans key was executed along with the line at the beginning and end of it. The function __enumext_start_save_ans_msg: will be passed to __enumext_storing_set:n and the function __enumext_stop_save_ans_msg: will be passed to the function __enumext_execute_after_env:.

```
1841 \cs_new_protected:Nn \__enumext_start_save_ans_msg:
1842   {
1843     \msg_term:nnVV { enumext } { save-ans-log }
1844       \g__enumext_envir_name_tl \l__enumext_store_name_tl
1845   }
1846 \cs_new_protected:Nn \__enumext_stop_save_ans_msg:
1847   {
1848     \msg_term:nnVV { enumext } { save-ans-log-hook }
1849       \g__enumext_envir_name_tl \g__enumext_store_name_tl
1850   }
```

(*End of definition for* `\__enumext_start_save_ans_msg:` *and* `\__enumext_stop_save_ans_msg:`.)

__enumext_storing_set:n
__enumext_storing_exec:

The function __enumext_storing_set:n first pass the value of the save-ans key to the variable \l__enumext_store_name_tl which will contain the *"store name"* of the ⟨*sequence*⟩ and ⟨*prop list*⟩ we will use. If \l__enumext_store_name_tl is *empty* we return an error message, otherwise will return the appropriate message __enumext_start_save_ans_msg: and proceed to execute the function __enumext_storing_exec: for enumext and enumext* environments.

```
1851 \cs_new_protected:Npn \__enumext_storing_set:n #1
1852   {
1853     \tl_set:Ne \l__enumext_store_name_tl {#1}
1854     \tl_if_empty:NTF \l__enumext_store_name_tl
1855       {
1856         \bool_lazy_or:nnT
1857           { \l__enumext_standar_first_bool } { \l__enumext_starred_first_bool }
1858           {
1859             \msg_error:nnV { enumext } { save-ans-empty } \g__enumext_envir_name_tl
1860           }
1861       }
1862       {
1863         \bool_lazy_or:nnT
```

```
1864              { \l__enumext_standar_first_bool } { \l__enumext_starred_first_bool }
1865              {
1866                \__enumext_start_save_ans_msg:
1867                \__enumext_storing_exec:
1868              }
1869          }
1870      }
```

The function `\__enumext_storing_exec:` will set to true the variable `\l__enumext_store_active_-bool` which activates the use of the `\anskey` command and the `keyans`, `keyans*` and `keyanspic` environments and will set to true the variable `\l__enumext_check_answers_bool` used for checking answers by the `check-ans` and `no-store` keys, copy {⟨*store name*⟩} into the global variable `\g__enumext_-store_name_tl` and execute the function `\__enumext_anskey_env_make:V` creating the environment `anskey*` (§11.30). The ⟨*prop list*⟩ `\g__enumext_series_⟨store name⟩_prop` and the ⟨*sequence*⟩ `\g__-enumext_series_⟨store name⟩_seq` will be created globally to *"store content"* in case they do not exist together with the integer variable `\g__enumext_series_⟨store name⟩_int` used by the keys `resume` and `resume*`.

```
1871  \cs_new_protected:Nn \__enumext_storing_exec:
1872    {
1873      \bool_set_true:N \l__enumext_store_active_bool
1874      \bool_set_true:N \l__enumext_check_answers_bool
1875      \tl_gset:NV \g__enumext_store_name_tl \l__enumext_store_name_tl
1876      \__enumext_anskey_env_make:V \l__enumext_store_name_tl
1877      \prop_if_exist:cF { g__enumext_ \l__enumext_store_name_tl _prop }
1878        {
1879          \msg_log:nnV { enumext } { store-prop } \l__enumext_store_name_tl
1880          \prop_new:c { g__enumext_ \l__enumext_store_name_tl _prop }
1881        }
1882      \seq_if_exist:cF { g__enumext_ \l__enumext_store_name_tl _seq }
1883        {
1884          \msg_log:nnV { enumext } { store-seq } \l__enumext_store_name_tl
1885          \seq_new:c { g__enumext_ \l__enumext_store_name_tl _seq }
1886        }
1887      \int_if_exist:cF { g__enumext_resume_ \l__enumext_store_name_tl _int }
1888        {
1889          \msg_log:nnV { enumext } { store-int } \l__enumext_store_name_tl
1890          \int_new:c { g__enumext_resume_ \l__enumext_store_name_tl _int }
1891        }
1892    }
```

(*End of definition for* `\__enumext_storing_set:n` *and* `\__enumext_storing_exec:`.)

11.25.3 The check answer mechanism

The mechanism for checking that all questions are answered follows this logic:

> If the line begins with `\item` or `\item*` and does NOT *open a nested environment*, each `\item` or `\item*` must contain a *single* execution of the `\anskey` command, i.e. the counter of the executions of the `\anskey` command must be equal to the counter associated with the sum of executions of `\item` and `\item*`.

> If the line begins with `\item` or `\item*` and *opens a nested environment* each `\item` or `\item*` in the nested environment must have a *single* execution of the `\anskey` command and the counter associated to the sum of `\item` and `\item*` executions must decrementing by *"one"* to maintain equality.

In order for the mechanism for the check-answer to work (not counting `keyans`, `keyans*` and `keyanspic`) we need:

1. We must keep track of the total number of `\item` and `\item*` (enumerated) that appear within the environment including the nested levels.
2. We must keep track of the total number of `\item` and `\item*` (enumerated) that appear per level of nesting.
3. Keeping track of the number of times the environment nests.

The integer variable associated to the sum of each `\item` and `\item*` in the environment `\g__enumext_-item_number_int` must match the integer variable `\g__enumext_item_anskey_int` associated to the execution of the command `\anskey`. We analyze the cases:

a) If the list only has one level the number of `\item` + `\item*` = `\anskey`
b) If the list has *nested levels*, for each level of nesting we need to decrementing by one (for the `\item` or `\item*` that opens the nest) so that the account remains the same.

With keyans, keyans* and keyanspic it is enough to increase in one the integer of \anskey. The integers created must be global if they are not lost in the interior levels of nesting and to execute the test we will use a *"hook"* function after closing the first level of the environment.

11.25.4 Setting check-ans and no-store keys

check-ans
no-store

Now we define the keys check-ans and no-store for all levels of enumext and enumext* environments.

```
1893 \cs_set_protected:Npn \__enumext_tmp:n #1
1894   {
1895     \keys_define:nn { enumext / #1 }
1896       {
1897         check-ans .bool_set:N = \l__enumext_check_ans_key_bool,
1898         check-ans .initial:n  = false,
1899         check-ans .value_required:n = true,
1900         no-store  .code:n = {
1901                             \bool_set_false:N \l__enumext_check_answers_bool
1902                             \bool_set_false:N \l__enumext_check_ans_key_bool
1903                           },
1904         no-store  .value_forbidden:n = true,
1905       }
1906   }
1907 \clist_map_inline:nn
1908   {
1909     level-1, level-2, level-3, level-4, enumext*
1910   }
1911   { \__enumext_tmp:n {#1} }
```

(*End of definition for* check-ans *and* no-store*.*)

11.25.5 Set-up check answer mechanism

__enumext_check_ans_active:
__enumext_check_ans_level:

The function __enumext_check_ans_active: will first check the state of the variable \l__enumext_-store_name_tl, that is, the save-ans key is active, if so it will check the state of the variable \l__enumext_check_answers_bool handled by the key no-store and will execute the function __enumext_check_ans_level: only if *"true"*, i.e. the key no-store is not active.

```
1912 \cs_new_protected:Nn \__enumext_check_ans_active:
1913   {
1914     \tl_if_empty:NF \l__enumext_store_name_tl
1915       {
1916         \bool_if:NT \l__enumext_check_answers_bool
1917           {
1918             \__enumext_check_ans_level:
1919           }
1920       }
1921   }
```

The function __enumext_check_ans_level: will decrement by *"one"* the value of the variable \g__-enumext_item_number_int which keeps track of the executions of \item and \item* for each level of nesting of the environment enumext, taking into account whether it is nested within enumext* or the opposite and set \l__enumext_item_number_bool to *"false"*.

```
1922 \cs_new_protected:Nn \__enumext_check_ans_level:
1923   {
1924     \int_case:nn { \l__enumext_level_int }
1925       {
1926       { 1 }{
1927             \bool_lazy_all:nT
1928               {
1929                 { \bool_if_p:N \g__enumext_starred_bool }
1930                 { \int_compare_p:nNn { \l__enumext_level_h_int } = { 1 } }
1931               }
1932               {
1933                 \int_gdecr:N \g__enumext_item_number_int
1934                 \bool_set_false:N \l__enumext_item_number_bool
1935               }
1936           }
1937       { 2 }{
1938             \int_gdecr:N \g__enumext_item_number_int
1939             \bool_set_false:N \l__enumext_item_number_bool
1940           }
1941       { 3 }{
1942             \int_gdecr:N \g__enumext_item_number_int
1943             \bool_set_false:N \l__enumext_item_number_bool
1944           }
```

```
1945              { 4 }{
1946                    \int_gdecr:N \g__enumext_item_number_int
1947                    \bool_set_false:N \l__enumext_item_number_bool
1948                }
1949          }
```

We should only execute this if enumext* is nested in the first level of enumext, for the rest of the cases the value of \g__enumext_item_number_int is already decreased.

```
1950      \int_case:nn { \l__enumext_level_h_int }
1951          {
1952              { 1 }{
1953                    \bool_lazy_all:nT
1954                        {
1955                          { \bool_if_p:N \g__enumext_standar_bool }
1956                          { \int_compare_p:nNn { \l__enumext_level_int } = { 1 } }
1957                        }
1958                        {
1959                          \int_gdecr:N \g__enumext_item_number_int
1960                          \bool_set_false:N \l__enumext_item_number_bool
1961                        }
1962                }
1963          }
1964      }
```

(*End of definition for* __enumext_check_ans_active: *and* __enumext_check_ans_level:.)

__enumext_check_ans_key_hook: The function __enumext_check_ans_key_hook: will *export* the status of the local variable \l__-enumext_check_ans_key_bool to the global variable \g__enumext_check_ans_key_bool only if the key check-ans is active.

```
1965  \cs_new_protected:Nn \__enumext_check_ans_key_hook:
1966      {
1967        \bool_lazy_and:nnT
1968          { \bool_if_p:N \l__enumext_check_ans_key_bool }
1969          { \bool_if_p:N \g__enumext_standar_bool }
1970          {
1971            \bool_gset_true:N \g__enumext_check_ans_key_bool
1972          }
1973        \bool_lazy_and:nnT
1974          { \bool_if_p:N \l__enumext_check_ans_key_bool }
1975          { \bool_if_p:N \g__enumext_starred_bool }
1976          {
1977            \bool_gset_true:N \g__enumext_check_ans_key_bool
1978          }
1979      }
```

(*End of definition for* __enumext_check_ans_key_hook:.)

__enumext_item_answer_diff: The function __enumext_item_answer_diff: will set the value of the variable \g__enumext_item_-answer_diff_int which is used by the functions __enumext_check_ans_show: for the key save-ans and by the function __enumext_check_ans_log: by the internal *"check answer"* mechanism. This function will be passed to the function __enumext_execute_after_env:.

```
1980  \cs_new_protected:Nn \__enumext_item_answer_diff:
1981      {
1982        \int_gset:Nn \g__enumext_item_answer_diff_int
1983            {
1984              \int_sign:n { \g__enumext_item_number_int - \g__enumext_item_anskey_int }
1985            }
1986      }
```

(*End of definition for* __enumext_item_answer_diff:.)

__enumext_check_ans_show:
__enumext_check_ans_msg_less:
__enumext_check_ans_msg_same_ok:
__enumext_check_ans_msg_greater:

The function __enumext_check_ans_show: will be executed within the function __enumext_-execute_after_env: when the key check-ans is active, that is, when \g__enumext_check_ans_-key_bool is *"true"* and will return the appropriate message according to the value of \g__enumext_-item_answer_diff_int set by the function __enumext_item_answer_diff:.

```
1987  \cs_new_protected:Nn \__enumext_check_ans_show:
1988      {
1989        \int_case:nn { \g__enumext_item_answer_diff_int }
1990            {
1991              { -1 }{ \__enumext_check_ans_msg_less:      }
1992              {  0 }{ \__enumext_check_ans_msg_same_ok: }
```

```
1993            {  1 }{ \__enumext_check_ans_msg_greater: }
1994          }
1995      }
1996  \cs_new_protected:Nn \__enumext_check_ans_msg_less:
1997    {
1998      \msg_warning:nneee { enumext } { item-less-answer } { \g__enumext_store_name_tl }
1999          { \g__enumext_envir_name_tl } { \g__enumext_start_line_tl }
2000    }
2001  \cs_new_protected:Nn \__enumext_check_ans_msg_same_ok:
2002    {
2003      \msg_term:nneee { enumext } { items-same-answer } { \g__enumext_store_name_tl }
2004          { \g__enumext_envir_name_tl } { \g__enumext_start_line_tl }
2005    }
2006  \cs_new_protected:Nn \__enumext_check_ans_msg_greater:
2007    {
2008      \msg_warning:nneee { enumext } { item-greater-answer } { \g__enumext_store_name_tl }
2009          { \g__enumext_envir_name_tl } { \g__enumext_start_line_tl }
2010    }
```

(*End of definition for* __enumext_check_ans_show: *and others.*)

__enumext_check_ans_log:
__enumext_check_ans_log_msg_less:
__enumext_check_ans_log_msg_same_ok:
__enumext_check_ans_log_msg_greater:

The function __enumext_check_ans_log: will be executed within the function __enumext_-execute_after_env: when the key check-ans is not active, that is, when \g__enumext_check_-ans_key_bool is *"false"* and write in the log the appropriate message according to the value of \g__-enumext_item_answer_diff_int set by the function __enumext_item_answer_diff:.

```
2011  \cs_new_protected:Nn \__enumext_check_ans_log:
2012    {
2013      \int_case:nn { \g__enumext_item_answer_diff_int }
2014        {
2015          { -1 }{ \__enumext_check_ans_log_msg_less:     }
2016          {  0 }{ \__enumext_check_ans_log_msg_same_ok: }
2017          {  1 }{ \__enumext_check_ans_log_msg_greater: }
2018        }
2019    }
2020  \cs_new_protected:Nn \__enumext_check_ans_log_msg_less:
2021    {
2022      \msg_log:nneee { enumext } { item-less-answer } { \g__enumext_store_name_tl }
2023          { \g__enumext_envir_name_tl } { \g__enumext_start_line_tl }
2024    }
2025  \cs_new_protected:Nn \__enumext_check_ans_log_msg_same_ok:
2026    {
2027      \msg_log:nneee { enumext } { items-same-answer }  { \g__enumext_store_name_tl }
2028          { \g__enumext_envir_name_tl } { \g__enumext_start_line_tl }
2029    }
2030  \cs_new_protected:Nn \__enumext_check_ans_log_msg_greater:
2031    {
2032      \msg_log:nneee { enumext } { item-greater-answer } { \g__enumext_store_name_tl }
2033          { \g__enumext_envir_name_tl } { \g__enumext_start_line_tl }
2034    }
```

(*End of definition for* __enumext_check_ans_log: *and others.*)

11.25.6 Check for \item* and \anspic* commands

__enumext_check_starred_cmd:n

The function __enumext_check_starred_cmd:n performs an extra check for the keyans, keyans* and keyanspic environments. Unlike the check executed by check-ans key this one is not controlled by any key, it is intended to prevent the forgetting of \item* or \anspic* in these environments.

```
2035  \cs_new_protected:Npn \__enumext_check_starred_cmd:n #1
2036    {
2037      \int_compare:nNnT
2038        { \g__enumext_check_starred_cmd_int } = { 0 }
2039        {
2040          \msg_warning:nnnV
2041            { enumext } { missing-starred }{ #1 } \l__enumext_check_start_line_env_tl
2042        }
2043      \int_compare:nNnT
2044        { \g__enumext_check_starred_cmd_int } > { 1 }
2045        {
2046          \msg_warning:nnnV
2047            { enumext } { many-starred }{ #1 } \l__enumext_check_start_line_env_tl
2048        }
2049      \int_gzero:N \g__enumext_check_starred_cmd_int
```

```
2050        \tl_clear:N \l__enumext_check_start_line_env_tl
2051    }
```

(*End of definition for* __enumext_check_starred_cmd:n.)

11.26   Keys and functions associated with storage

wrap-ans
wrap-opt
save-sep
mark-ans
mark-pos
show-ans
mark-ref
save-ref

We add the keys wrap-ans, wrap-opt, save-sep, mark-ans, mark-pos, show-ans, show-pos, mark-ref and save-ref related to the *"storage system"* and internal mechanism of *"label and ref"* only at the *first level* of enumext and enumext*.

```
2052 \cs_set_protected:Npn \__enumext_tmp:n #1
2053   {
2054     \keys_define:nn { enumext / #1 }
2055       {
2056         wrap-ans    .cs_set_protected:Np = \__enumext_anskey_wrapper:n ##1,
2057         wrap-ans    .initial:n =
2058                       {
2059                         \fbox{\parbox[t]{\dimeval{\itemwidth -2\fboxsep -2\fboxrule}}{##1}}
2060                       },
2061         wrap-ans    .value_required:n = true,
2062         wrap-opt    .cs_set_protected:Np = \__enumext_keyans_wrapper_opt:n ##1,
2063         wrap-opt    .initial:n = [{##1}],
2064         wrap-opt    .value_required:n = true,
2065         save-sep    .tl_set:N  = \l__enumext_store_keyans_item_opt_sep_tl,
2066         save-sep    .initial:n = {, ~ },
2067         save-sep    .value_required:n = true,
2068         mark-ans    .tl_set:N  = \l__enumext_mark_answer_sym_tl,
2069         mark-ans    .initial:n = \textasteriskcentered,
2070         mark-ans    .value_required:n = true,
2071         mark-pos    .choice:,
2072         mark-pos / left    .code:n = \str_set:Nn \l__enumext_mark_position_str { l },
2073         mark-pos / right   .code:n = \str_set:Nn \l__enumext_mark_position_str { r },
2074         mark-pos / unknown .code:n =
2075                             \msg_error:nneee { enumext } { unknown-choice }
2076                               { mark-pos } { left, ~ right } { \exp_not:n {##1} },
2077         mark-pos    .initial:n = right,
2078         mark-pos    .value_required:n = true,
2079         show-ans    .bool_set:N = \l__enumext_show_answer_bool,
2080         show-ans    .initial:n  = false,
2081         show-ans    .value_required:n = true,
2082         show-pos    .bool_set:N = \l__enumext_show_position_bool,
2083         show-pos    .initial:n  = false,
2084         show-pos    .value_required:n = true,
2085         mark-ref    .tl_set:N   = \l__enumext_mark_ref_sym_tl,
2086         mark-ref    .initial:n  = \textasteriskcentered,
2087         mark-ref    .value_required:n = true,
2088         save-ref    .bool_set:N = \l__enumext_store_ref_key_bool,
2089         save-ref    .initial:n  = false,
2090         save-ref    .value_required:n = true,
2091       }
2092   }
2093 \clist_map_inline:nn { level-1, enumext* } { \__enumext_tmp:n {#1} }
```

(*End of definition for* wrap-ans *and others.*)

mark-pos
show-ans
show-pos

For the keyans and keyans* environments we will only add the keys mark-pos, show-ans and show-pos.

```
2094 \cs_set_protected:Npn \__enumext_tmp:n #1
2095   {
2096     \keys_define:nn { enumext / #1 }
2097       {
2098         mark-pos .choice:,
2099         mark-pos / left  .code:n = \str_set:Nn \l__enumext_mark_position_str { l },
2100         mark-pos / right .code:n = \str_set:Nn \l__enumext_mark_position_str { r },
2101         mark-pos .initial:n = right,
2102         mark-pos .value_required:n  = true,
2103         show-ans .bool_set:N = \l__enumext_show_answer_bool,
2104         show-ans .initial:n  = false,
2105         show-ans .value_required:n = true,
2106         show-pos .bool_set:N = \l__enumext_show_position_bool,
2107         show-pos .initial:n  = false,
2108         show-pos .value_required:n = true,
```

```
2109        }
2110      }
2111 \clist_map_inline:nn { keyans, keyans* } { \__enumext_tmp:n {#1} }
```

(*End of definition for* mark-pos *,* show-ans *, and* show-pos*.*)

11.26.1   Store optional arguments of the environments

The idea behind *"storing"* in the ⟨*sequence*⟩ is to have a copy of the structure of the environment in which the key save-ans is being executed so we must capture the optional arguments passed to the levels of the environment in which it is executed and *"storing"* them.

__enumext_store_active_keys:n
__enumext_store_active_keys_vii:n

The functions __enumext_store_active_keys:n and __enumext_store_active_keys_vii:n will be responsible for *"storing"* the ⟨*keys*⟩ filtered from the optional arguments of the environment in which the key save-ans is executed and the levels within this for the enumext and enumext* environments. We will execute this function only if the variable \l__enumext_store_save_key_X_bool is false, that is, the key store-key is not active, establishing the variable \l__enumext_store_save_key_X_tl with the filtered ⟨*keys*⟩.

```
2112 \cs_new_protected:Npn \__enumext_store_active_keys:n #1
2113   {
2114     \bool_if:cF { l__enumext_store_save_key_ \__enumext_level: _bool }
2115       {
2116         \tl_clear:c { l__enumext_save_key_ \__enumext_level: _tl }
2117         \tl_set:ce
2118           { l__enumext_store_save_key_ \__enumext_level: _tl }
2119           { \__enumext_filter_save_key:n {#1} }
2120       }
2121   }
2122 \cs_new_protected:Npn \__enumext_store_active_keys_vii:n #1
2123   {
2124     \bool_if:NF \l__enumext_store_save_key_vii_bool
2125       {
2126         \tl_clear:N \l__enumext_store_save_key_vii_tl
2127         \tl_set:Ne \l__enumext_store_save_key_vii_tl { \__enumext_filter_save_key:n {#1} }
2128       }
2129   }
```

(*End of definition for* __enumext_store_active_keys:n *and* __enumext_store_active_keys_vii:n*.*)

11.26.2   Setting save-key key

Since this list structure will be stored in the ⟨*sequence*⟩ established by the save-ans key when executing \anskey, we will not be able to modify it. The best thing here is to have a key that allows you to modify the optional argument of the list stored in the ⟨*sequence*⟩.

save-key   The values set by this key passed in the optional arguments of the enumext and enumext* environments will override the values of the \l__enumext_store_save_key_X_tl variable set by the functions __enumext_store_active_keys:n and __enumext_store_active_keys_vii:n.

Define the key save-key for all levels of enumext and enumext* environments.

```
2130 \cs_set_protected:Npn \__enumext_tmp:n #1
2131   {
2132     \keys_define:nn { enumext / enumext* }
2133       {
2134         save-key .code:n = \__enumext_parse_save_key_vii:n {##1},
2135         save-key .value_required:n = true,
2136       }
2137     \keys_define:nn { enumext / #1 }
2138       {
2139         save-key .code:n = \__enumext_parse_save_key:n {##1},
2140         save-key .value_required:n = true,
2141       }
2142   }
2143 \clist_map_inline:nn { level-1, level-2, level-3, level-4 } { \__enumext_tmp:n {#1} }
```

(*End of definition for* save-key*.*)

__enumext_parse_save_key:n
__enumext_parse_save_key_vii:n

The functions __enumext_parse_save_key:n and __enumext_parse_save_key_vii:n will be responsible for storing the filtered ⟨*keys*⟩ in the variable \l__enumext_store_save_key_X_tl for enumext and enumext*.

```
2144 \cs_new_protected:Npn \__enumext_parse_save_key:n #1
2145   {
2146     \bool_set_true:c { l__enumext_store_save_key_ \__enumext_level: _bool }
```

```
2147        \tl_clear:c { l__enumext_save_key_ \__enumext_level: _tl }
2148        \tl_set:ce
2149          { l__enumext_store_save_key_ \__enumext_level: _tl }
2150          { \__enumext_filter_save_key:n {#1} }
2151      }
2152 \cs_new_protected:Npn \__enumext_parse_save_key_vii:n #1
2153    {
2154      \bool_set_true:N \l__enumext_store_save_key_vii_bool
2155      \tl_clear:N \l__enumext_store_save_key_vii_tl
2156      \tl_set:Ne \l__enumext_store_save_key_vii_tl { \__enumext_filter_save_key:n {#1} }
2157    }
```

(*End of definition for* __enumext_parse_save_key:n *and* __enumext_parse_save_key_vii:n.)

11.26.3   Internal functions to store optional arguments

__enumext_filter_save_key:n
__enumext_filter_save_key_key:n
__enumext_filter_save_key_pair:nn

The function __enumext_filter_save_key:n will be in charge of filtering the ⟨*keys*⟩ we want to *store* in ⟨*sequence*⟩ where {#1} represents the optional value passed to the environment.

```
2158 \cs_new:Npn \__enumext_filter_save_key:n #1
2159    {
2160      \use:e
2161        {
2162          \keyval_parse:NNn
2163            \__enumext_filter_save_key_key:n
2164            \__enumext_filter_save_key_pair:nn {#1}
2165        }
2166    }
```

The function __enumext_filter_save_key_key:n will be responsible for filtering the ⟨*keys*⟩ that are passed *"without value"* by excluding the resume, resume*, no-store and base-fix keys.

```
2167 \cs_new:Npn \__enumext_filter_save_key_key:n #1
2168    {
2169      \str_case:nnF {#1}
2170        {
2171          { resume } {} { resume* } {} { no-store } {} { base-fix } {}
2172        }
2173        { , { \exp_not:n {#1} } }
2174    }
```

The function __enumext_filter_save_key_pair:nn will be responsible for filtering the ⟨*keys*⟩ that are passed *"with value"* by excluding the series, resume, save-ans, save-ref, check-ans, show-ans, save-pos, wrap-ans, mark-ans, wrap-opt, save-sep, mark-ref, mini-env, mini-sep, mini-right and mini-right* keys.

```
2175 \cs_new:Npn \__enumext_filter_save_key_pair:nn #1#2
2176    {
2177      \str_case:nnF {#1}
2178        {
2179          { series   } {} { resume    } {} { save-ans } {} { save-ref   } {}
2180          { save-key } {} { check-ans } {} { show-ans } {} { show-pos   } {}
2181          { wrap-ans } {} { mark-ans  } {} { wrap-opt } {} { save-sep   } {}
2182          { mark-ref } {} { mini-env  } {} { mini-sep } {} { mini-right } {}
2183          { mini-right* } {}
2184        }
2185        { , { \exp_not:n {#1} } = { \exp_not:n {#2} } }
2186    }
```

(*End of definition for* __enumext_filter_save_key:n, __enumext_filter_save_key_key:n, *and* __enumext_filter_-save_key_pair:nn.)

11.26.4   Function for storing content in prop list

__enumext_store_addto_prop:n
__enumext_store_addto_prop:V

The function __enumext_store_addto_prop:n stores the content in ⟨*prop list*⟩ defined by save-ans key. The *"stored content"* is retrieved by means of the \getkeyans command.

The form in which the content is *"stored"* in the ⟨*prop list*⟩ is {⟨*position*⟩}{⟨*content*⟩}. This function is used by \anskey in enumext and enumext* environments, \item* in keyans and keyans* environments and \anspic* in keyanspic environment.

```
2187 \cs_new_protected:Npn \__enumext_store_addto_prop:n #1
2188    {
2189      \prop_gput_if_not_in:cen { g__enumext_ \l__enumext_store_name_tl _prop }
2190        {
2191          \int_eval:n { \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop } + 1 }
2192        }
2193        { #1 }
```

```
2194    }
2195 \cs_generate_variant:Nn \__enumext_store_addto_prop:n { V, e }
```

(*End of definition for* __enumext_store_addto_prop:n.)

11.26.5 Function for storing content in sequence

__enumext_store_addto_seq:n
__enumext_store_addto_seq:v
__enumext_store_addto_seq:V

The function __enumext_store_addto_seq:n stores the content in ⟨*sequence*⟩ defined by save-ans key. This function is used by \anskey in enumext, \item* in keyans and \anspic in keyanspic. The form in which the content is stored in ⟨*sequence*⟩ is in a internal enumext or enumext* environments with the *same structure* in which the command was executed.
The *"stored content"* is retrieved by means of the \printkeyans command.

```
2196 \cs_new_protected:Npn \__enumext_store_addto_seq:n #1
2197    {
2198       \seq_gput_right:cn { g__enumext_ \l__enumext_store_name_tl _seq } { #1 }
2199    }
2200 \cs_generate_variant:Nn \__enumext_store_addto_seq:n { v, V, e }
```

(*End of definition for* __enumext_store_addto_seq:n.)

11.26.6 Functions for storing the list structure in the sequence

__enumext_store_level_open:
__enumext_store_level_close:

The memorization structure of the list is handled by the functions __enumext_store_level_open: and __enumext_store_level_close: which are executed per level within the enumext environment.

```
2201 \cs_new_protected:Nn \__enumext_store_level_open:
2202    {
2203       \bool_if:NT \l__enumext_check_answers_bool
2204          {
2205             \tl_if_empty:cTF { l__enumext_store_save_key_ \__enumext_level: _tl }
2206                {
2207                   \__enumext_store_addto_seq:n
2208                      {
2209                         \item \begin{enumext}
2210                      }
2211                }
2212                {
2213                   \tl_put_left:cn { l__enumext_store_save_key_ \__enumext_level: _tl }
2214                      {
2215                         \item \begin{enumext} [
2216                      }
2217                   \tl_put_right:cn { l__enumext_store_save_key_ \__enumext_level: _tl }
2218                      {
2219                         ]
2220                      }
2221                   \__enumext_store_addto_seq:v { l__enumext_store_save_key_ \__enumext_level: _tl }
2222                }
2223          }
2224    }
2225 \cs_new_protected:Nn \__enumext_store_level_close:
2226    {
2227       \bool_if:NT \l__enumext_check_answers_bool
2228          {
2229             \__enumext_store_addto_seq:n { \end{enumext} }
2230          }
2231    }
```

(*End of definition for* __enumext_store_level_open: *and* __enumext_store_level_close:.)

__enumext_store_level_open_vii:
__enumext_store_level_close_vii:

The memorization structure of the list is handled by the functions __enumext_store_level_open_vii: and __enumext_store_level_close_vii: which are executed in the enumext* environment.

```
2232 \cs_new_protected:Nn \__enumext_store_level_open_vii:
2233    {
2234       \bool_if:NT \l__enumext_check_answers_bool
2235          {
2236             \tl_if_empty:NTF \l__enumext_store_save_key_vii_tl
2237                {
2238                   \__enumext_store_addto_seq:n
2239                      {
2240                         \item \begin{enumext*}
2241                      }
2242                }
2243                {
```

```
2244            \tl_put_left:Nn \l__enumext_store_save_key_vii_tl
2245              {
2246                \item \begin{enumext*}[
2247              }
2248            \tl_put_right:Nn \l__enumext_store_save_key_vii_tl
2249              {
2250                ]
2251              }
2252            \__enumext_store_addto_seq:V \l__enumext_store_save_key_vii_tl
2253          }
2254        }
2255    }
2256 \cs_new_protected:Nn \__enumext_store_level_close_vii:
2257    {
2258      \bool_if:NT \l__enumext_check_answers_bool
2259        {
2260          \__enumext_store_addto_seq:n { \end{enumext*} }
2261        }
2262    }
```

(*End of definition for* __enumext_store_level_open_vii: *and* __enumext_store_level_close_vii:.)

11.26.7 Function for show marks and position

__enumext_print_keyans_box:NN
__enumext_print_keyans_box:cc

The function __enumext_print_keyans_box:NN print a box in the left margin with \l__enumext_-mark_answer_sym_tl used by the wrap-ans, show-ans and show-pos keys. The function takes two arguments:

#1 : \l__enumext_labelwidth_X_dim
#2 : \l__enumext_labelsep_X_dim

```
2263 \cs_new_protected:Nn \__enumext_print_keyans_box:NN
2264    {
2265      \mode_leave_vertical:
2266      \skip_horizontal:n { -\dim_use:N #2 }
2267      \makebox[0pt][ r ]
2268        {
2269          \makebox[ \dim_use:N #1 ][ \l__enumext_mark_position_str ]
2270            {
2271              \tl_use:N \l__enumext_mark_answer_sym_tl
2272            }
2273        }
2274      \skip_horizontal:n { \dim_use:N #2 }
2275    }
2276 \cs_generate_variant:Nn \__enumext_print_keyans_box:NN { cc }
```

(*End of definition for* __enumext_print_keyans_box:NN.)

11.27 The internal label and ref

The function __enumext_store_internal_ref: handles the internal *"label and ref"* system used by the save-ref and mark-ref keys for \anskey will allow to execute \ref{⟨*store name* : *position*⟩} and will return 1.(a).i.A.

__enumext_store_internal_ref:

First we will remove the dots "." from the current ⟨*labels*⟩, we do not want to get double dots in our references, then we will place this in the variable \l__enumext_newlabel_arg_two_tl.

```
2277 \cs_new_protected:Nn \__enumext_store_internal_ref:
2278    {
2279      \cs_set_protected:Npn \__enumext_tmp:n ##1
2280        {
2281          \tl_set_eq:cc { l__enumext_label_copy_##1_tl } { l__enumext_label_##1_tl }
2282          \tl_reverse:c { l__enumext_label_copy_##1_tl }
2283          \tl_remove_once:cn { l__enumext_label_copy_##1_tl } { . }
2284          \tl_reverse:c { l__enumext_label_copy_##1_tl }
2285        }
2286      \clist_map_inline:nn { i, ii, iii, iv, vii } { \__enumext_tmp:n {##1} }
2287      \cs_set:Npn \__enumext_tmp:n ##1
2288        { . \tl_use:c { l__enumext_label_copy_ \int_to_roman:n {##1} _tl } }
```

Here we need to analyse the cases where the environment is started with enumext* and if \anskey or anskey* is running alone in it or if it is running in a nested enumext environment within the starting environment.

```
2289      \bool_lazy_all:nT
2290        {
```

```
2291            { \bool_if_p:N \g__enumext_starred_bool }
2292            { \int_compare_p:nNn { \l__enumext_level_int } = { 0 } }
2293          }
2294          {
2295            \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2296              { \tl_use:N \l__enumext_label_copy_vii_tl }
2297          }
2298        \bool_lazy_all:nT
2299          {
2300            { \bool_not_p:n { \g__enumext_standar_bool } }
2301            { \bool_if_p:N \l__enumext_standar_bool }
2302            { \int_compare_p:nNn { \l__enumext_level_int } > { 0 } }
2303          }
2304          {
2305            \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2306              {
2307                \tl_use:N \l__enumext_label_copy_vii_tl
2308                \int_step_function:nnN { 1 } { \l__enumext_level_int } \__enumext_tmp:n
2309              }
2310          }
```

If started with enumext and if \anskey or anskey* is running alone in it or if it is running in a nested enumext* environment within the starting environment.

```
2311        \bool_lazy_all:nT
2312          {
2313            { \bool_if_p:N \g__enumext_standar_bool }
2314            { \int_compare_p:nNn { \l__enumext_level_int } > { 0 } }
2315            { \int_compare_p:nNn { \l__enumext_level_h_int } = { 0 } }
2316          }
2317          {
2318            \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2319              {
2320                \tl_use:N \l__enumext_label_copy_i_tl
2321                \int_step_function:nnN { 2 } { \l__enumext_level_int } \__enumext_tmp:n
2322              }
2323          }
2324        \cs_set:Npn \__enumext_tmp:n ##1
2325          { \tl_use:c { l__enumext_label_copy_ \int_to_roman:n {##1} _tl } . }
2326        \bool_lazy_all:nT
2327          {
2328            { \bool_if_p:N \g__enumext_standar_bool }
2329            { \bool_if_p:N \l__enumext_starred_bool }
2330            { \int_compare_p:nNn { \l__enumext_level_int } > { 0 } }
2331          }
2332          {
2333            \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2334              {
2335                \int_step_function:nnN { 1 } { \l__enumext_level_int } \__enumext_tmp:n
2336                \tl_use:N \l__enumext_label_copy_vii_tl
2337              }
2338          }
```

Now we set the variable \l__enumext_newlabel_arg_one_tl which will contain {⟨*store name* : *position*⟩}.

```
2339        \tl_put_right:Ne \l__enumext_newlabel_arg_one_tl
2340          {
2341            \l__enumext_store_name_tl \c_colon_str
2342            \int_eval:n { \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop } }
2343          }
```

Now execute the function __enumext_newlabel:nn and save the result in the variable \l__enumext_write_aux_file_tl and finally we write in the .aux file.

```
2344        \tl_put_right:Ne \l__enumext_write_aux_file_tl
2345          {
2346            \__enumext_newlabel:nn
2347              { \exp_not:V \l__enumext_newlabel_arg_one_tl }
2348              { \l__enumext_newlabel_arg_two_tl }
2349          }
2350      \l__enumext_write_aux_file_tl
2351    }
```

(*End of definition for* __enumext_store_internal_ref:.)

11.28   Common functions for `\anskey` **and** `anskey*` **environment**

`\__enumext_store_anskey_code:n`

The internal function `\__enumext_store_anskey_code:n` first we pass the ⟨*argument*⟩ to the ⟨*prop list*⟩, then checks the state of the variable `\l__enumext_store_ref_key_bool` handled by the `save-ref` key and will call the function `\__enumext_store_internal_ref:` for the internal *"label and ref"* system. Followed by this if the `show-ans` or `show-pos` keys are active we will show the *"wrapped"* ⟨*argument*⟩.

```
2352 \cs_new_protected:Npn \__enumext_store_anskey_code:n #1
2353   {
2354     \int_gincr:N \g__enumext_item_anskey_int
2355     \__enumext_store_addto_prop:n {#1}
2356     \bool_if:NT \l__enumext_store_ref_key_bool
2357       {
2358         \__enumext_store_internal_ref:
2359       }
2360     \__enumext_anskey_show_wrap_left:n { #1 }
```

Now we start processing the [⟨*key = val*⟩] passed to the command to build our `\item` in the variable `\l__enumext_store_anskey_arg_tl` which we will *"store"* in the ⟨*sequence*⟩. First we clear the variable `\l__enumext_store_anskey_arg_tl` and process the ⟨*keys*⟩, if the `break-col` key is present and the command is running under `enumext` (not in `enumext*`) we will add `\columnbreak` and then `\item`.

```
2361     \tl_clear:N \l__enumext_store_anskey_arg_tl
2362     \bool_lazy_and:nnT
2363       { \bool_if_p:N \l__enumext_store_columns_break_bool }
2364       { \bool_not_p:n { \l__enumext_starred_bool } }
2365       {
2366         \tl_put_left:Nn \l__enumext_store_anskey_arg_tl { \columnbreak }
2367       }
2368     \tl_put_right:Nn \l__enumext_store_anskey_arg_tl { \item }
```

If the `item-join` key is present and the command is running under `enumext*` we will add (⟨*number*⟩) to `\l__enumext_store_anskey_arg_tl`.

```
2369     \bool_lazy_and:nnT
2370       { \bool_not_p:n { \l__enumext_starred_bool } }
2371       { \int_compare_p:nNn { \l__enumext_store_item_join_int } > { 1 } }
2372       {
2373         \tl_put_right:Ne \l__enumext_store_anskey_arg_tl
2374           {
2375             ( \exp_not:V \l__enumext_store_item_join_int )
2376           }
2377       }
```

And now we will review the keys `item-star`, `item-sym*` and `item-pos*` and pass them to `\l__enumext_store_anskey_arg_tl` along with the ⟨*argument*⟩ for `\anskey` or ⟨*body*⟩ for `anskey*`.

```
2378     \bool_if:NTF \l__enumext_store_item_star_bool
2379       {
2380         \tl_put_right:Nn \l__enumext_store_anskey_arg_tl { * }
2381         \tl_if_empty:NF \l__enumext_store_item_symbol_tl
2382           {
2383             \tl_put_right:Ne \l__enumext_store_anskey_arg_tl
2384               {
2385                 [ \exp_not:V \l__enumext_store_item_symbol_tl ]
2386               }
2387           }
2388         \dim_compare:nT
2389           {
2390             \l__enumext_store_item_symbol_sep_dim != \c_zero_dim
2391           }
2392           {
2393             \tl_put_right:Ne \l__enumext_store_anskey_arg_tl
2394               {
2395                 [ \exp_not:V \l__enumext_store_item_symbol_sep_dim ]
2396               }
2397           }
2398         \tl_put_right:Nn \l__enumext_store_anskey_arg_tl {#1}
2399       }
2400       {
2401         \tl_put_right:Nn \l__enumext_store_anskey_arg_tl {#1}
2402       }
```

Finally we check if the `save-ref` key are active along with the `hyperref` package load, if both conditions are met, it will create the `\hyperlink` with *symbol* set by `mark-ref` key and then store in ⟨*sequence*⟩.

```
2403     \bool_lazy_and:nnT
```

```
2404          { \bool_if_p:N \l__enumext_store_ref_key_bool }
2405          { \bool_if_p:N \l__enumext_hyperref_bool }
2406          {
2407            \tl_put_right:Ne \l__enumext_store_anskey_arg_tl
2408              {
2409                \hfill \exp_not:N \hyperlink { \exp_not:V \l__enumext_newlabel_arg_one_tl }
2410                      { \exp_not:V \l__enumext_mark_ref_sym_tl }
2411              }
2412          }
2413        \__enumext_store_addto_seq:V \l__enumext_store_anskey_arg_tl
2414    }
```

(*End of definition for* __enumext_store_anskey_code:n.)

__enumext_anskey_show_wrap_arg:n   The function __enumext_anskey_show_wrap_arg:n *"wraps"* the ⟨*argument*⟩ passed to \anskey and the ⟨*body*⟩ for anskey* when using the wrap-ans key.

```
2415 \cs_new_protected:Npn \__enumext_anskey_show_wrap_arg:n #1
2416    {
2417      \par
2418      \bool_if:NTF \l__enumext_starred_bool
2419        {
2420          \__enumext_print_keyans_box:NN \l__enumext_labelwidth_vii_dim  \l__enumext_labelsep_vii_d
2421        }
2422        {
2423          \__enumext_print_keyans_box:cc
2424            { l__enumext_labelwidth_ \__enumext_level: _dim }
2425            { l__enumext_labelsep_ \__enumext_level: _dim }
2426        }
2427      \__enumext_anskey_wrapper:n { #1 }
2428    }
```

(*End of definition for* __enumext_anskey_show_wrap_arg:n.)

__enumext_anskey_show_wrap_left:n   The function __enumext_anskey_show_wrap_left:n will show the *"mark"* defined by the mark-ans key or the *"position"* of the content stored in the ⟨*prop list*⟩ when using the show-pos key on the left margin next to the *"wraps"* ⟨*argument*⟩ passed to \anskey and the ⟨*body*⟩ in anskey* on the right side when using the show-ans key.

```
2429 \cs_new_protected:Npn \__enumext_anskey_show_wrap_left:n #1
2430    {
2431      \bool_if:NT \l__enumext_show_answer_bool
2432        {
2433          \__enumext_anskey_show_wrap_arg:n { #1 }
2434        }
2435      \bool_if:NT \l__enumext_show_position_bool
2436        {
2437          \tl_set:Ne \l__enumext_mark_answer_sym_tl
2438            {
2439              \group_begin:
2440              \exp_not:N \normalfont
2441              \exp_not:N \footnotesize [ \int_eval:n
2442                {
2443                  \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop }
2444                }
2445              ]
2446              \group_end:
2447            }
2448          \__enumext_anskey_show_wrap_arg:n { #1 }
2449        }
2450    }
```

(*End of definition for* __enumext_anskey_show_wrap_left:n.)

11.29   The command \anskey

Since we will be *"storing content"* in a list environment within ⟨*sequences*⟩ and can (more or less) manage the options passed to each level, it is necessary that we have a little more control over \item when storing.

The \anskey command will cover this point and give it similar behaviour to that of \item in the enumext and enumext* environments executed as follows \anskey[⟨*key = val*⟩]{⟨*content*⟩}.

__enumext_anskey_unknown:n
__enumext_anskey_unknown:nn

First we'll add the keys `break-col`, `item-join`, `item-star`, `item-sym*` and `item-pos*`.

```
2451  \keys_define:nn { enumext / anskey }
2452    {
2453      break-col .bool_set:N = \l__enumext_store_columns_break_bool,
2454      break-col .default:n  = true,
2455      break-col .value_forbidden:n = true,
2456      item-join .int_set:N  = \l__enumext_store_item_join_int,
2457      item-join .value_required:n = true,
2458      item-star .bool_set:N = \l__enumext_store_item_star_bool,
2459      item-star .default:n  = true,
2460      item-star .value_forbidden:n = true,
2461      item-sym* .tl_set:N   = \l__enumext_store_item_symbol_tl,
2462      item-sym* .value_required:n = true,
2463      item-pos* .dim_set:N  = \l__enumext_store_item_symbol_sep_dim,
2464      item-pos* .value_required:n = true,
2465      unknown   .code:n      = { \__enumext_anskey_unknown:n {#1} },
2466    }
```

The ⟨*keys*⟩ are stored in `\l_keys_key_str` and the value (if any) is passed as an argument to the function `\__enumext_anskey_unknown:n`.

```
2467  \cs_new_protected:Npn \__enumext_anskey_unknown:n #1
2468    {
2469      \exp_args:NV \__enumext_anskey_unknown:nn \l_keys_key_str {#1}
2470    }
2471  \cs_new_protected:Npn \__enumext_anskey_unknown:nn #1 #2
2472    {
2473      \tl_if_blank:nTF {#2}
2474        {
2475          \msg_error:nnn { enumext } { anskey-cmd-key-unknown } {#1}
2476        }
2477        {
2478          \msg_error:nnnn { enumext } { anskey-cmd-key-value-unknown } {#1} {#2}
2479        }
2480    }
```

(*End of definition for* __enumext_anskey_unknown:n *and* __enumext_anskey_unknown:nn.)

💣 The \anskey command will only be present when using the `save-ans` key in `enumext` and `enumext*` environments, otherwise it will return an error.

\anskey
We will first call the function `\__enumext_anskey_safe_outer:` to be sure where we execute the command, then we will check the state of the variable `\l__enumext_check_answers_bool` set by the key `no-store`, if is true we will increment `\g__enumext_item_anskey_int` for the internal *"check answer"* system and execute the function `\__enumext_anskey_safe_inner:n` to ensure that the command is not nested and that the argument is not empty, finally search the [⟨*key = val*⟩] and call the function `\__enumext_store_anskey_code:n`.

```
2481  \NewDocumentCommand \anskey { o +m }
2482    {
2483      \__enumext_anskey_safe_outer:
2484      \group_begin:
2485        \bool_if:NT \l__enumext_check_answers_bool
2486          {
2487            \tl_if_novalue:nF {#1}
2488              {
2489                \keys_set:nn { enumext / anskey } {#1}
2490              }
2491            \tl_if_blank:nTF {#2}
2492              {
2493                \msg_error:nn { enumext } { anskey-empty-arg }
2494              }
2495              {
2496                \__enumext_anskey_safe_inner:
2497                \__enumext_store_anskey_code:n {#2}
2498              }
2499          }
2500      \group_end:
2501    }
```

(*End of definition for* \anskey. *This function is documented on page* *12.*)

11.29.1   Internal functions for the command

`\__enumext_anskey_safe_outer:`
`\__enumext_anskey_safe_inner:`

The `\__enumext_store_anskey_safe_outer:` function will return the appropriate messages when the command is executed outside the environment in which the save-ans key was activated.

```
2502  \cs_new_protected:Nn \__enumext_anskey_safe_outer:
2503    {
2504      \bool_if:NF \l__enumext_store_active_bool
2505        {
2506          \msg_error:nnnn { enumext } { anskey-wrong-place }{ anskey }{ enumext }
2507        }
2508      \int_compare:nNnT { \l__enumext_keyans_level_int } = { 1 }
2509        {
2510          \msg_error:nnnn { enumext } { command-wrong-place }{ anskey }{ keyans }
2511        }
2512      \int_compare:nNnT { \l__enumext_keyans_level_h_int } = { 1 }
2513        {
2514          \msg_error:nnnn { enumext } { command-wrong-place }{ anskey }{ keyans* }
2515        }
2516      \int_compare:nNnT { \l__enumext_keyans_pic_level_int } = { 1 }
2517        {
2518          \msg_error:nnnn { enumext } { command-wrong-place }{ anskey }{ keyanspic }
2519        }
2520    }
```

The `\__enumext_anskey_safe_inner:` function will first check if the command is nested, if preceded by a not numbered `\item` or if it is in *math mode* returning the appropriate messages.

```
2521  \cs_new_protected:Nn \__enumext_anskey_safe_inner:
2522    {
2523      \int_incr:N \l__enumext_anskey_level_int
2524      \int_compare:nNnT { \l__enumext_anskey_level_int } > { 1 }
2525        {
2526          \msg_error:nn { enumext } { anskey-nested }
2527        }
2528      \bool_if:NF \l__enumext_item_number_bool
2529        {
2530          \msg_error:nn { enumext } { anskey-unnumber-item }
2531        }
2532      \mode_if_math:T
2533        {
2534          \msg_error:nne { enumext } { anskey-math-mode } { \c_backslash_str anskey }
2535        }
2536    }
```

(*End of definition for* `\__enumext_anskey_safe_outer:` *and* `\__enumext_anskey_safe_inner:`.)

11.30   The environment anskey*

Managing *verbatim content* in an environment is quite complicated, I learned that when creating the scontents package, so to be able to have support at this point it is best to play a little with the internal code of scontents and *hooks*. Some considerations I should have here before implementing this:

- If some package, class or user has defined the environment with the same name somewhere in the document it would be a problem, you would not know what argument has been passed to store-env, if you are using the key print-env or the write-out key, sure, I can detect and modify it within the enumext and enumext* environments, but it would look strange not to have some keys available when running within these environments.
- A better (perhaps a bit paranoid) option is to define it within the environment in which the save-ans key is executed. and have it available only when that key is executed, here I would have absolute control of the ⟨keys⟩ and I make sure that write-out is not used, then using *hooks after* I undefine it and using *hook before* I check if it has been created by any package, class or user and I return a error, then the user will have to see how to solve the problem.

`\__enumext_undefine_anskey_env:`

The function `\__enumext_undefine_anskey_env:` will undefine the environment anskey* and will be passed to the function `\__enumext_execute_after_env:` (§11.31) which is executed after the environment in which the key save-ans is active.

```
2537  \cs_new_protected:Nn \__enumext_undefine_anskey_env:
2538    {
2539      \cs_undefine:c { anskey* }
2540      \cs_undefine:c { endanskey* }
2541      \cs_undefine:c { __scontents_anskey*_env_begin: }
2542      \cs_undefine:c { __scontents_anskey*_env_end: }
2543    }
```

Detection of the anskey* environment outside the enumext and enumext* environments.

```
2544 \__enumext_before_env:nn { enumext }
2545   {
2546     \bool_lazy_and:nnT
2547       { \int_compare_p:nNn { \l__enumext_level_int } = { 0 } }
2548       { \int_compare_p:nNn { \l__enumext_level_h_int } = { 0 } }
2549       {
2550         \cs_if_free:cF { __scontents_anskey*_env_begin: }
2551           {
2552             \msg_error:nnn { enumext } { anskey-env-error } { anskey* }
2553           }
2554       }
2555   }
2556 \__enumext_before_env:nn { enumext* }
2557   {
2558     \bool_lazy_and:nnT
2559       { \int_compare_p:nNn { \l__enumext_level_int } = { 0 } }
2560       { \int_compare_p:nNn { \l__enumext_level_h_int } = { 0 } }
2561       {
2562         \cs_if_free:cF { __scontents_anskey*_env_begin: }
2563           {
2564             \msg_error:nnn { enumext } { anskey-env-error } { anskey* }
2565           }
2566       }
2567   }
```

Detection of the anskey* environment inside the keyans, keyans* and keyanspic environments, if preceded by a not numbered \item or if it is in *math mode* returning the appropriate messages.

```
2568 \__enumext_before_env:nn { anskey* }
2569   {
2570     \int_compare:nNnT { \l__enumext_keyans_level_int } = { 1 }
2571       {
2572         \msg_error:nnn { enumext } { anskey-env-wrong }{ keyans }
2573       }
2574     \int_compare:nNnT { \l__enumext_keyans_level_h_int } = { 1 }
2575       {
2576         \msg_error:nnn { enumext } { anskey-env-wrong } { keyans* }
2577       }
2578     \int_compare:nNnT { \l__enumext_keyans_pic_level_int } = { 1 }
2579       {
2580         \msg_error:nnn { enumext } { anskey-env-wrong } { keyanspic }
2581       }
2582     \bool_if:NF \l__enumext_item_number_bool
2583       {
2584         \msg_error:nn { enumext } { anskey-unnumber-item }
2585       }
2586     \mode_if_math:T
2587       {
2588         \msg_error:nnn { enumext } { anskey-math-mode } { anskey* }
2589       }
2590   }
```

(*End of definition for* __enumext_undefine_anskey_env:.)

anskey*
__enumext_anskey_env_make:n
__enumext_anskey_env_make:V
__enumext_anskey_env_define_keys:
__enumext_rescan_anskey_env:n

The function __enumext_anskey_env_make:n creates the environment anskey* (*custom version* of scontents environment) by setting the initial keys store-env={⟨*store name*⟩} and print-env=false. To maintain the *scope* of the environment and that it is only active when the key save-ans is active we will pass this function to the function __enumext_storing_exec: (§11.25.1) and we will execute it only if the variable \l__enumext_anskey_env_bool is true, with this we prevent it from being executed again when the environment is nested and the key save-ans is active, which returns an error for part of the package scontents.

```
2591 \cs_new_protected:Npn \__enumext_anskey_env_make:n #1
2592   {
2593     \bool_if:NT \l__enumext_anskey_env_bool
2594       {
2595         \newenvsc{anskey*}[store-env=#1,print-env=false]
2596         \__enumext_anskey_env_exec:
2597       }
2598   }
2599 \cs_generate_variant:Nn \__enumext_anskey_env_make:n { V }
```

The function __enumext_anskey_env_define_keys: will add the keys break-col, item-join, item-join, item-star, item-sym* and item-pos* and will leave the keys print-env, store-env and write-out undefined. We will apply this function using the *hook* function __enumext_before_-env:nn.

```
2600  \cs_new_protected:Nn \__enumext_anskey_env_define_keys:
2601    {
2602      \keys_define:nn { scontents / scontents }
2603        {
2604          break-col .bool_gset:N = \g__enumext_store_columns_break_bool,
2605          break-col .default:n   = true,
2606          break-col .value_forbidden:n = true,
2607          item-join .int_gset:N  = \g__enumext_store_item_join_int,
2608          item-join .value_required:n = true,
2609          item-star .bool_gset:N = \g__enumext_store_item_star_bool,
2610          item-star .default:n   = true,
2611          item-star .value_forbidden:n = true,
2612          item-sym* .tl_gset:N   = \g__enumext_store_item_symbol_tl,
2613          item-sym* .value_required:n = true,
2614          item-pos* .dim_gset:N  = \g__enumext_store_item_symbol_sep_dim,
2615          item-pos* .value_required:n = true,
2616          print-env .undefine:,
2617          store-env .undefine:,
2618          write-out .undefine:,
2619          unknown   .code:n      = { \__enumext_anskey_env_unknown:n {##1} },
2620        }
2621    }
```

The ⟨keys⟩ are stored in \l_keys_key_str and the value (if any) is passed as an argument to the function __enumext_anskey_env_unknown:n.

```
2622  \cs_new_protected:Npn \__enumext_anskey_env_unknown:n #1
2623    {
2624      \exp_args:NV \__enumext_anskey_env_unknown:nn \l_keys_key_str {#1}
2625    }
2626  \cs_new_protected:Npn \__enumext_anskey_env_unknown:nn #1#2
2627    {
2628      \tl_if_blank:nTF {#2}
2629        {
2630          \msg_error:nnn { enumext } { anskey-env-key-unknown } {#1}
2631        }
2632        {
2633          \msg_error:nnnn { enumext } { anskey-env-key-value-unknown } {#1} {#2}
2634        }
2635    }
```

The function __enumext_anskey_env_reset_keys: will leave the keys break-col, item-join, item-join, item-star, item-sym* and item-pos* undefined. We will apply this function using the *hook* function __enumext_after_env:nn.

```
2636  \cs_new_protected:Nn \__enumext_anskey_env_reset_keys:
2637    {
2638      \keys_define:nn { scontents / scontents }
2639        {
2640          break-col .undefine:,
2641          item-join .undefine:,
2642          item-star .undefine:,
2643          item-sym* .undefine:,
2644          item-pos* .undefine:,
2645          write-out .code:n    = {
2646                                   \bool_set_false:N \l__scontents_storing_bool
2647                                   \bool_set_true:N  \l__scontents_writing_bool
2648                                   \tl_set:Nn \l__scontents_fname_out_tl {##1}
2649                                 },
2650          write-out .value_required:n = true,
2651          print-env .meta:nn   = { scontents } { print-env = ##1 },
2652          print-env .default:n = true,
2653          store-env .meta:nn   = { scontents } { store-env = ##1 },
2654          unknown   .code:n    = { \__scontents_parse_environment_keys:n {##1} },
2655        }
2656    }
```

The function __enumext_rescan_anskey_env:n will be responsible for bringing the ⟨body⟩ of the environment saved in the sequence \g__scontents_name_⟨store name⟩_seq to pass it to our *sequence* and *prop list*.

```
2657  \cs_new_protected:Npn \__enumext_rescan_anskey_env:n #1
2658    {
2659      \group_begin:
2660        \int_set:Nn \tex_newlinechar:D { `\^^J }
2661        \__scontents_rescan_tokens:x
2662          {
2663            \endgroup % This assumes \catcode`\\=0... Things might go off otherwise.
2664            #1
2665          }
2666    }
```

(*End of definition for* anskey* *and others. This function is documented on page* 13*.*)

__enumext_anskey_env_exec: The function __enumext_anskey_env_exec: will be responsible for processing all the code necessary for the execution of the environment. The first thing will be to add our ⟨keys⟩.

```
2667  \cs_new_protected:Nn \__enumext_anskey_env_exec:
2668    {
2669      \__enumext_before_env:nn { anskey* }
2670        {
2671          \__enumext_anskey_env_define_keys:
2672        }
```

Now we will execute our actions after the anskey* environment is closed. We'll fetch the contents of the *environment body* that is now saved in \g__scontents_name_⟨*store name*⟩_seq and store it in the variable \l__enumext_store_anskey_env_tl then we execute the rest of the functions.

```
2673      \hook_if_empty:nF {env/anskey*/after}
2674        {
2675          \hook_gremove_code:nn {env/anskey*/after} { * }
2676        }
2677      \__enumext_after_env:nn { anskey* }
2678        {
2679          \__enumext_anskey_env_save_keys:
2680          \tl_clear:N \l__enumext_store_anskey_env_tl
2681          \tl_clear:N \l__enumext_store_anskey_opt_tl
2682          \bool_if:NT \l__enumext_check_answers_bool
2683            {
2684              \tl_gset:Ne \l__enumext_store_anskey_env_tl
2685                {
2686                  \seq_item:ce { g__scontents_name_ \l__enumext_store_name_tl _seq } { -1 }
2687                }
2688              \regex_match:nVTF
2689                { ^\s* \z | ^\s* \u{c__scontents_hidden_space_str} \z }
2690                \l__enumext_store_anskey_env_tl
2691                {
2692                  \msg_error:nn { enumext } { anskey-empty-arg }
2693                }
2694                {
2695                  \__enumext_anskey_env_store:
2696                }
2697            }
2698          \__enumext_anskey_env_clean_vars:
2699          \__enumext_anskey_env_reset_keys:
2700        }
2701    }
```

🎯 The use of \hook_gremove_code:nn is necessary here, otherwise the {⟨*code*⟩} passed to __enumext_after_-env:nn{anskey*} will be accumulated for each execution. The last function __enumext_anskey_env_reset_-keys: is necessary so as not to hinder any scontents environment running within enumext or enumext*.

(*End of definition for* __enumext_anskey_env_exec:*.*)

__enumext_anskey_env_save_keys: The function __enumext_anskey_env_save_keys: processing the [⟨*key = val*⟩] passed to the envi-
__enumext_anskey_env_store: ronment and save this in the variable \l__enumext_store_anskey_opt_tl. If the break-col key is
__enumext_anskey_env_clean_vars: present and the environment is running under enumext (not in enumext*) we will add the key break-col.

```
2702  \cs_new_protected:Nn \__enumext_anskey_env_save_keys:
2703    {
2704      \bool_lazy_and:nnT
2705        { \bool_if_p:N \g__enumext_store_columns_break_bool }
2706        { \bool_not_p:n { \l__enumext_starred_bool } }
2707        {
2708          \tl_put_left:Ne \l__enumext_store_anskey_opt_tl { ,break-col, }
2709        }
```

If the `item-join` key is present and the command is running under `enumext*` we will add to `\l__enumext_store_anskey_opt_tl`.

```
2710      \bool_lazy_and:nnT
2711        { \bool_not_p:n { \l__enumext_starred_bool } }
2712        { \int_compare_p:nNn { \g__enumext_store_item_join_int } > { 1 } }
2713        {
2714          \tl_put_left::Ne \l__enumext_store_anskey_opt_tl
2715            {
2716              ,item-join = \exp_not:V \g__enumext_store_item_join_int,
2717            }
2718        }
```

And now we will review the keys `item-star`, `item-sym*` and `item-pos*` and pass them to `\l__enumext_store_anskey_opt_tl`.

```
2719      \bool_if:NT \g__enumext_store_item_star_bool
2720        {
2721          \tl_put_left:Ne \l__enumext_store_anskey_opt_tl
2722            {
2723              ,item-star,
2724            }
2725          \tl_if_empty:NF \g__enumext_store_item_symbol_tl
2726            {
2727              \tl_put_left:Ne \l__enumext_store_anskey_opt_tl
2728                {
2729                  ,item-sym* = \exp_not:V \g__enumext_store_item_symbol_tl,
2730                }
2731            }
2732          \dim_compare:nT
2733            {
2734              \g__enumext_store_item_symbol_sep_dim != \c_zero_dim
2735            }
2736            {
2737              \tl_put_left:Ne \l__enumext_store_anskey_opt_tl
2738                {
2739                  ,item-pos* = \exp_not:V \g__enumext_store_item_symbol_sep_dim,
2740                }
2741            }
2742        }
2743    }
```

The function `\__enumext_anskey_env_store:` will be responsible for storing the content of the environment using the functions `\__enumext_store_anskey_code:n` and `\__enumext_rescan_anskey_env:n`.

```
2744 \cs_new_protected:Nn \__enumext_anskey_env_store:
2745    {
2746      \group_begin:
2747        \tl_if_empty:NTF \l__enumext_store_anskey_opt_tl
2748          {
2749            \exp_args:Ne
2750              \__enumext_store_anskey_code:n
2751                {
2752                  \__enumext_rescan_anskey_env:n { \l__enumext_store_anskey_env_tl }
2753                }
2754          }
2755          {
2756            \keys_set_known:nV { enumext / anskey } \l__enumext_store_anskey_opt_tl
2757            \exp_args:Ne
2758              \__enumext_store_anskey_code:n
2759                {
2760                  \__enumext_rescan_anskey_env:n { \l__enumext_store_anskey_env_tl }
2761                }
2762          }
2763      \group_end:
2764    }
```

The function `\__enumext_anskey_env_clean_vars:` will return the global variables used by the ⟨*keys*⟩ to their initial state.

```
2765 \cs_new_protected:Nn \__enumext_anskey_env_clean_vars:
2766    {
2767      \bool_gset_false:N \g__enumext_store_columns_break_bool
2768      \int_gzero:N        \g__enumext_store_item_join_int
2769      \bool_gset_false:N \g__enumext_store_item_star_bool
```

```
2770        \tl_gclear:N          \g__enumext_store_item_symbol_tl
2771        \dim_gzero:N          \g__enumext_store_item_symbol_sep_dim
2772      }
```

(*End of definition for* __enumext_anskey_env_save_keys:, __enumext_anskey_env_store:, *and* __enumext_anskey_-
env_clean_vars:.)

11.31   Executing anskey*, check-ans and write .log

__enumext_execute_after_env: The __enumext_execute_after_env: function will first return the appropriate message for the end
of the environment in which the save-ans key is being executed, then call the __enumext_item_-
answer_diff: function and then will write the values of the global variables used to the .log file. If the key
check-ans is active it will execute the function __enumext_check_ans_show: and show the result in
the terminal, otherwise it will execute the function __enumext_check_ans_log: and write the results in
the .log file, undefine the environment anskey* (§11.30) through the function __enumext_undefine_-
anskey_env: and finally we execute the function __enumext_reset_global_vars: returning the
used variables to their original state.

```
2773  \cs_new_protected:Nn \__enumext_execute_after_env:
2774    {
2775      \int_compare:nNnT { \l__enumext_level_int } = { 0 }
2776        {
2777          \tl_if_empty:NF \g__enumext_store_name_tl
2778            {
2779              \__enumext_stop_save_ans_msg:
2780              \__enumext_item_answer_diff:
2781              \__enumext_log_global_vars:
2782              \__enumext_log_answer_vars:
2783              \bool_if:NTF \g__enumext_check_ans_key_bool
2784                {
2785                  \__enumext_check_ans_show:
2786                }
2787                { \__enumext_check_ans_log: }
2788              \__enumext_undefine_anskey_env:
2789            }
2790          \__enumext_reset_global_vars:
2791        }
2792    }
```

(*End of definition for* __enumext_execute_after_env:.)

💣 This function is passed to the function __enumext_after_env:nn for the environments enumext (§11.38) and
enumext* (§11.43) and it is executed only when the environments are not nested or at some level of these..

11.32   Common functions for keyans, keyans* and keyanspic

11.32.1   Storing content in prop list

__enumext_keyans_addto_prop:n   The function __enumext_keyans_addto_prop:n will pass the contents of the current ⟨*label*⟩ \l__-
enumext_label_v_tl for the keyans environment and the current ⟨*label*⟩ \l__enumext_label_vi_-
tl for the keyanspic environment when using \item* and \anspic*, followed by the *contents* of the
optional argument of both commands to the \l__enumext_store_current_label_tl variable, which
will be passed to the ⟨*prop list*⟩ defined by the save-ans key using the __enumext_store_addto_-
prop:V.

```
2793  \cs_new_protected:Npn \__enumext_keyans_addto_prop:n #1
2794    {
2795      \tl_clear:N \l__enumext_store_current_label_tl
2796      \int_compare:nNnTF { \l__enumext_keyans_pic_level_int } = { 1 }
2797        {
2798          \tl_put_right:Ne \l__enumext_store_current_label_tl { \l__enumext_label_vi_tl }
2799        }
2800        {
2801          \tl_put_right:Ne \l__enumext_store_current_label_tl { \l__enumext_label_v_tl }
2802        }
2803      \tl_if_novalue:nF { #1 }
2804        {
2805          % Set save-sep
2806          \tl_if_empty:NF \l__enumext_store_keyans_item_opt_sep_tl
2807            {
2808              \tl_put_right:Ne \l__enumext_store_current_label_tl { \l__enumext_store_keyans_item_o
2809            }
2810          \tl_put_right:Ne \l__enumext_store_current_label_tl { #1 }
2811        }
2812      \__enumext_store_addto_prop:V \l__enumext_store_current_label_tl
```

2813 　　}

(*End of definition for* __enumext_keyans_addto_prop:n.)

11.32.2 The save-ref key for keyans, keyans* and keyanspic

The *"internal label and ref"* system for the keyans, keyans* and keyanspic environments has slight differences with the one implemented for the \anskey command, basically because in this environments we are interested in the current ⟨*label*⟩. The mechanism defined here will allow to execute \ref{⟨*store name : position*⟩} and will return 1.(A).

__enumext_keyans_store_ref:
__enumext_keyans_store_ref_aux_i:
__enumext_keyans_store_ref_aux_ii:

The function __enumext_keyans_store_ref: handles the internal *"label and ref"* system used by the save-ref key for \item* and \anspic* commands. First we will create copies of the current ⟨*labels*⟩ and remove the dots "." from them, we do not want to get double dots in our references.

```
2814 \cs_new_protected:Nn \__enumext_keyans_store_ref:
2815   {
2816     \bool_if:NT \l__enumext_store_ref_key_bool
2817       {
2818         \cs_set_protected:Npn \__enumext_tmp:n ##1
2819           {
2820             \tl_set_eq:cc { l__enumext_label_copy_##1_tl } { l__enumext_label_##1_tl }
2821             \tl_reverse:c { l__enumext_label_copy_##1_tl }
2822             \tl_remove_once:cn { l__enumext_label_copy_##1_tl } { . }
2823             \tl_reverse:c { l__enumext_label_copy_##1_tl }
2824           }
2825         \clist_map_inline:nn { i, v, vi, vii, viii } { \__enumext_tmp:n {##1} }
2826         \__enumext_keyans_store_ref_aux_i:
2827       }
2828   }
```

The auxiliary function __enumext_keyans_store_ref_aux_i: set the variable \l__enumext_newlabel_arg_one_tl which will contain {⟨*store name : position*⟩} analyzing whether the environment in which they are executed is enumext* or enumext.

```
2829 \cs_new_protected:Nn \__enumext_keyans_store_ref_aux_i:
2830   {
2831     \bool_if:NT \g__enumext_starred_bool
2832       {
2833         \tl_set_eq:NN \l__enumext_label_copy_i_tl \l__enumext_label_copy_vii_tl
2834       }
2835     \int_compare:nNnT { \l__enumext_keyans_pic_level_int } = { 1 }
2836       {
2837         \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2838           { \l__enumext_label_copy_i_tl . \l__enumext_label_copy_vi_tl }
2839       }
2840     \int_compare:nNnT { \l__enumext_keyans_level_int } = { 1 }
2841       {
2842         \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2843           { \l__enumext_label_copy_i_tl . \l__enumext_label_copy_v_tl }
2844       }
2845     \int_compare:nNnT { \l__enumext_keyans_level_h_int } = { 1 }
2846       {
2847         \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2848           { \l__enumext_label_copy_i_tl . \l__enumext_label_copy_viii_tl }
2849       }
2850     \tl_put_right:Ne \l__enumext_newlabel_arg_one_tl
2851       {
2852         \l__enumext_store_name_tl \c_colon_str
2853         \int_eval:n { \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop } }
2854       }
2855     \__enumext_keyans_store_ref_aux_ii:
2856   }
```

Now auxiliary function __enumext_keyans_store_ref_aux_ii: save the result in the variable \l__enumext_write_aux_file_tl and finally we write in the .aux file.

```
2857 \cs_new_protected:Nn \__enumext_keyans_store_ref_aux_ii:
2858   {
2859     \tl_put_right:Ne \l__enumext_write_aux_file_tl
2860       {
2861         \__enumext_newlabel:nn
2862           { \exp_not:V \l__enumext_newlabel_arg_one_tl }
2863           { \l__enumext_newlabel_arg_two_tl }
2864       }
```

```
2865        \l__enumext_write_aux_file_tl
2866      }
```

(*End of definition for* __enumext_keyans_store_ref:, __enumext_keyans_store_ref_aux_i:, *and* __enumext_keyans_-
store_ref_aux_ii:.)

11.32.3   Storing content in sequence

__enumext_keyans_addto_seq:n   The function __enumext_keyans_addto_seq:n will pass the contents of the current ⟨*label*⟩ \l__-
__enumext_keyans_addto_seq_link: enumext_label_v_tl for the keyans environment and the \l__enumext_label_vi_tl for the
keyanspic environment when using \item* and \anspic*, followed by the ⟨*contents*⟩ of the optional
argument of both commands to the \l__enumext_store_current_label_tl variable to the sequence
defined by the save-ans key.

```
2867  \cs_new_protected:Npn \__enumext_keyans_addto_seq:n #1
2868    {
2869      \tl_clear:N \l__enumext_store_current_label_tl
2870      \int_compare:nNnTF { \l__enumext_keyans_pic_level_int } = { 1 }
2871        {
2872          \tl_put_right:Ne \l__enumext_store_current_label_tl { \item \l__enumext_label_vi_tl }
2873        }
2874        {
2875          \tl_put_right:Ne \l__enumext_store_current_label_tl { \item \l__enumext_label_v_tl }
2876        }
2877      \tl_if_novalue:nF { #1 }
2878        {
2879          \tl_if_empty:NF \l__enumext_store_keyans_item_opt_sep_tl
2880            {
2881              \tl_put_right:Ne \l__enumext_store_current_label_tl
2882                {
2883                  \l__enumext_store_keyans_item_opt_sep_tl
2884                }
2885            }
2886          \tl_put_right:Ne \l__enumext_store_current_label_tl { #1 }
2887        }
2888      \__enumext_keyans_addto_seq_link:
2889    }
```

Checks if the save-ref key is active along with the hyperref package load, if both conditions are met, it
will create the \hyperlink and then store using the __enumext_store_addto_seq:V function. Finally,
copy the contents of the variable \l__enumext_store_current_label_tl into the global variable
\g__enumext_check_ans_item_tl to be used by the function __enumext_check_starred_cmd:n
and increment the value of the integer variable \g__enumext_item_anskey_int handled by the check-
ans key.

```
2890  \cs_new_protected:Nn \__enumext_keyans_addto_seq_link:
2891    {
2892      \bool_lazy_and:nnT
2893        { \bool_if_p:N \l__enumext_store_ref_key_bool }
2894        { \bool_if_p:N \l__enumext_hyperref_bool }
2895        {
2896          \tl_put_right:Ne \l__enumext_store_current_label_tl
2897            {
2898              \hfill \exp_not:N \hyperlink
2899                {
2900                  \exp_not:V \l__enumext_newlabel_arg_one_tl
2901                }
2902                { \exp_not:V \l__enumext_mark_ref_sym_tl }
2903            }
2904        }
2905      \__enumext_store_addto_seq:V \l__enumext_store_current_label_tl
2906      \bool_if:NT \l__enumext_check_answers_bool
2907        {
2908          \int_gincr:N \g__enumext_item_anskey_int
2909        }
2910    }
```

(*End of definition for* __enumext_keyans_addto_seq:n *and* __enumext_keyans_addto_seq_link:.)

11.32.4   The show-ans and show-pos keys for keyans and keyanspic

The code is very similar to the \anskey code, but, if I change the order of the operations the counter off
⟨*label*⟩ are incorrect.

__enumext_keyans_show_left:n
__enumext_keyans_show_ans:
__enumext_keyans_show_pos:
__enumext_keyans_show_item_opt:

Common function to show *starred commands* \item* and ⟨*position*⟩ of stored content in ⟨*prop list*⟩ for keyans and keyanspic. Need add 1 to \g__enumext_⟨*store name*⟩_prop for show-pos key.

```
2911 \cs_new_protected:Npn \__enumext_keyans_show_left:n #1
2912   {
2913     \tl_if_novalue:nF { #1 }
2914       {
2915         \tl_set:Ne \l__enumext_store_current_opt_arg_tl { #1 }
2916       }
2917     \bool_if:NT \l__enumext_show_answer_bool
2918       {
2919         \__enumext_keyans_show_ans:
2920       }
2921     \bool_if:NT \l__enumext_show_position_bool
2922       {
2923         \__enumext_keyans_show_pos:
2924       }
2925   }
2926 \cs_new_protected:Nn \__enumext_keyans_show_item_opt:
2927   {
2928     \tl_if_empty:NF \l__enumext_store_current_opt_arg_tl
2929       {
2930         \bool_lazy_or:nnT
2931           { \bool_if_p:N \l__enumext_show_answer_bool }
2932           { \bool_if_p:N \l__enumext_show_position_bool }
2933           {
2934             \__enumext_keyans_wrapper_opt:n { \l__enumext_store_current_opt_arg_tl } \c_space_tl
2935           }
2936       }
2937   }
2938 \cs_new_protected:Nn \__enumext_keyans_show_ans:
2939   {
2940     \bool_if:NT \l__enumext_starred_bool
2941       {
2942         \dim_set_eq:NN \l__enumext_labelwidth_i_dim \l__enumext_labelwidth_vii_dim
2943         \dim_set_eq:NN \l__enumext_labelsep_i_dim \l__enumext_labelsep_vii_dim
2944       }
2945     \tl_put_left:Nn \l__enumext_label_v_tl
2946       {
2947         \__enumext_print_keyans_box:NN
2948           \l__enumext_labelwidth_i_dim \l__enumext_labelsep_i_dim
2949       }
2950   }
2951 \cs_new_protected:Nn \__enumext_keyans_show_pos:
2952   {
2953     \bool_if:NT \l__enumext_starred_bool
2954       {
2955         \dim_set_eq:NN \l__enumext_labelwidth_i_dim \l__enumext_labelwidth_vii_dim
2956         \dim_set_eq:NN \l__enumext_labelsep_i_dim \l__enumext_labelsep_vii_dim
2957       }
2958     \int_compare:nNnTF { \l__enumext_keyans_pic_level_int } = { 1 }
2959       {
2960         \tl_set:Ne \l__enumext_mark_answer_sym_tl
2961           {
2962             \group_begin:
2963             \exp_not:N \normalfont
2964             \exp_not:N \footnotesize [ \int_eval:n
2965               {
2966                 \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop }
2967               }
2968             ]
2969             \group_end:
2970           }
2971       }
2972       {
2973         \tl_set:Ne \l__enumext_mark_answer_sym_tl
2974           {
2975             \group_begin:
2976             \exp_not:N \normalfont
2977             \exp_not:N \footnotesize [ \int_eval:n
2978               {
2979                 \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop } + 1
```

```
2980                    }
2981                ]
2982            \group_end:
2983        }
2984    }
2985  \tl_put_left:Nn \l__enumext_label_v_tl
2986    {
2987        \__enumext_print_keyans_box:NN
2988          \l__enumext_labelwidth_i_dim \l__enumext_labelsep_i_dim
2989    }
2990  }
```

(*End of definition for* `\__enumext_keyans_show_left:n` *and others.*)

11.33 Redefining `\item` and `\makelabel` in enumext

Redefining the `\item` command is not as simple as I thought. This command works in conjunction with the `\makelabel` command so I have to redefine both of them, in addition to this, we will have to use a couple of *global* variables to pass the values from one command to the other.

The `\item` and `\item[`⟨*custom*⟩`]` commands work in the usual way on enumext and we will add `\item*`, `\item*[`⟨*symbol*⟩`]` and `\item*[`⟨*symbol*⟩`][`⟨*offset*⟩`]`.

`\__enumext_default_item:n` First we will see if the optional argument is present, if it is NOT present we will check the state of the variable `\l__enumext_check_answers_bool` set by the key `no-store`, set the boolean variable `\l__enumext_wrap_label_X_bool` to "true" for the key `wrap-label` and execute `\__enumext_item_std:w` and the key `itemindent`, otherwise we will check the state of the boolean variable `\l__enumext_wrap_label_opt_X_bool` set by the key `wrap-label*` and execute `\__enumext_item_std:w` with the optional argument and the key `itemindent`.

```
2991  \cs_new_protected:Npn \__enumext_default_item:n #1
2992    {
2993      \tl_if_novalue:nTF {#1}
2994        {
2995          \bool_if:NT \l__enumext_check_answers_bool
2996            {
2997              \int_gincr:N \g__enumext_item_number_int
2998              \bool_set_true:N \l__enumext_item_number_bool
2999            }
3000          \bool_set_true:c { l__enumext_wrap_label_ \__enumext_level: _bool }
3001          \__enumext_item_std:w \tl_use:c { l__enumext_fake_item_indent_ \__enumext_level: _tl }
3002        }
3003        {
3004          \bool_set_eq:cc
3005            { l__enumext_wrap_label_ \__enumext_level: _bool }
3006            { l__enumext_wrap_label_opt_ \__enumext_level: _bool }
3007          \__enumext_item_std:w [#1] \tl_use:c { l__enumext_fake_item_indent_ \__enumext_level: _tl
3008        }
3009    }
```

(*End of definition for* `\__enumext_default_item:n`.)

`\__enumext_starred_item:nn` The `\item*`, `\item*[`⟨*symbol*⟩`]` and `\item*[`⟨*symbol*⟩`][`⟨*offset*⟩`]` works like the *numbered* `\item`, but
`\__enumext_item_star_exec:` placing a ⟨*symbol*⟩ to the *"left"* of the ⟨*label*⟩ separated from it by the value the second optional argument ⟨*offset*⟩.
#1 : `\l__enumext_item_symbol_X_tl`
#2 : `\l__enumext_item_symbol_sep_X_dim`
First we will make a copy of `\l__enumext_item_symbol_X_tl` which is set by the key `item-sym*` or passed as *"first"* optional argument in the global variable `\g__enumext_item_symbol_aux_tl`, followed by setting the variable `\l__enumext_item_symbol_sep_X_dim` set by the key `item-pos*` or by the *"second"* optional argument, then we will see the state of the variable `\l__enumext_check_answers_bool` set by the key `no-store`, set the boolean variable `\l__enumext_wrap_label_X_bool` to "true" for the key `wrap-label` and execute `\__enumext_item_std:w` and the key `itemindent`.

```
3010  \cs_new_protected:Npn \__enumext_starred_item:nn #1 #2
3011    {
3012      \tl_if_novalue:nTF {#1}
3013        {
3014          \tl_gset_eq:Nc
3015            \g__enumext_item_symbol_aux_tl { l__enumext_item_symbol_ \__enumext_level: _tl }
3016        }
3017        {
3018          \tl_gset:Nn \g__enumext_item_symbol_aux_tl {#1}
```

```
3019              }
3020          \tl_if_novalue:nTF {#2}
3021              {
3022              \dim_set_eq:cc
3023                 { l__enumext_item_symbol_sep_ \__enumext_level: _dim }
3024                 { l__enumext_labelsep_ \__enumext_level: _dim }
3025              }
3026              {
3027              \dim_set:cn { l__enumext_item_symbol_sep_ \__enumext_level: _dim } {#2}
3028              }
3029          \bool_if:NT \l__enumext_check_answers_bool
3030              {
3031              \int_gincr:N \g__enumext_item_number_int
3032              \bool_set_true:N \l__enumext_item_number_bool
3033              }
3034          \bool_set_true:c { l__enumext_wrap_label_ \__enumext_level: _bool }
3035          \__enumext_item_std:w \tl_use:c { l__enumext_fake_item_indent_ \__enumext_level: _tl }
3036      }
```

The function `\__enumext_item_star_exec:` will be responsible for executing `\item*` for the `enumext` environment.

```
3037  \cs_new_protected:Nn \__enumext_item_star_exec:
3038      {
3039      \tl_if_empty:cF { l__enumext_item_symbol_ \__enumext_level: _tl }
3040          {
3041          \mode_leave_vertical:
3042          \skip_horizontal:n { -\dim_use:c { l__enumext_item_symbol_sep_ \__enumext_level: _dim } }
3043          \makebox[ 0pt ][ r ]{ \g__enumext_item_symbol_aux_tl }
3044          \skip_horizontal:n { \dim_use:c { l__enumext_item_symbol_sep_ \__enumext_level: _dim } }
3045          }
3046      }
```

(*End of definition for* `\__enumext_starred_item:nn` *and* `\__enumext_item_star_exec:`.)

`\__enumext_redefine_item:`
`\__enumext_make_label`

The function `\__enumext_redefine_item:` will redefine the `\item` command in the `enumext` environment adding `\item*`.

```
3047  \cs_new_protected:Nn \__enumext_redefine_item:
3048      {
3049      \RenewDocumentCommand \item { s o o }
3050          {
3051          \bool_if:nTF {##1}
3052              {
3053              \__enumext_starred_item:nn {##2} {##3}
3054              }
3055              { \__enumext_default_item:n {##2} }
3056          }
3057      }
```

The function `\__enumext_make_label:` redefine `\makelabel` for the keys `align`, `font`, `wrap-label`, `wrap-label*` and `\item*` for `enumext` environment.

```
3058  \cs_new_protected:Nn \__enumext_make_label:
3059      {
3060      \RenewDocumentCommand \makelabel { m }
3061          {
3062          \tl_use:c { l__enumext_label_fill_left_ \__enumext_level: _tl }
3063          \tl_use:c { l__enumext_label_font_style_ \__enumext_level: _tl }
3064          \bool_if:cTF { l__enumext_wrap_label_ \__enumext_level: _bool }
3065              {
3066              \__enumext_item_star_exec:
3067              \use:c { __enumext_wrapper_label_ \__enumext_level: :n } { ##1 }
3068              }
3069              { ##1 }
3070          \tl_use:c { l__enumext_label_fill_right_ \__enumext_level: _tl }
3071          \tl_gclear:N \g__enumext_item_symbol_aux_tl
3072          }
3073      }
```

(*End of definition for* `\__enumext_redefine_item:` *and* `\__enumext_make_label:`.)

🌀 This functions are passed to `\__enumext_list_arg_two_X:` used in the definition of the `enumext` environment (§11.38).

11.34 Setting `item-sym*` and `item-pos*` keys

In order to have a cleaner implementation of `\item*` for the enumext and enumext* environments it is best to define a couple of keys that allow us to control and set by default the ⟨*symbol*⟩ and its ⟨*offset*⟩.

item-sym*
item-pos*

Define and set `item-sym*` and `item-pos*` keys for enumext and enumext*.

```
3074 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
3075   {
3076     \keys_define:nn { enumext / #1 }
3077       {
3078         item-sym* .tl_set:c  = { l__enumext_item_symbol_#2_tl },
3079         item-sym* .value_required:n = true,
3080         item-sym* .initial:n  = {$\star$},
3081         item-pos* .dim_set:c  = { l__enumext_item_symbol_sep_#2_dim },
3082         item-pos* .value_required:n = true,
3083       }
3084   }
3085 \clist_map_inline:nn
3086   {
3087     {level-1}{i}, {level-2}{ii}, {level-3}{iii}, {level-4}{iv}, {enumext*}{vii}
3088   }
3089   { \__enumext_tmp:nn #1 }
```

(*End of definition for* `item-sym*` *and* `item-pos*`.)

11.35 Handling unknown keys

At this point in the code I already know that I will not add more ⟨*keys*⟩ and since I have already been quite *paranoid and restrictive* with the definitions of environments and commands, the only thing left to do is do it with the ⟨*keys*⟩ (you have to be consistent in life).

11.35.1 Handling unknown keys for keyans and keyans*

unknown
__enumext_keyans_unknown_keys:n
__enumext_keyans_unknown_keys:nn

Define and set unknown key for keyans and keyans* environments.

```
3090 \cs_set_protected:Npn \__enumext_tmp:n #1
3091   {
3092     \keys_define:nn { enumext / #1 }
3093       {
3094         unknown .code:n = { \__enumext_keyans_unknown_keys:n {##1} }
3095       }
3096   }
3097 \clist_map_inline:nn { keyans, keyans* } { \__enumext_tmp:n {#1} }
```

Internal functions for handling unknown key.

```
3098 \cs_new_protected:Npn \__enumext_keyans_unknown_keys:n #1
3099   {
3100     \exp_args:NV \__enumext_keyans_unknown_keys:nn \l_keys_key_str {#1}
3101   }
3102 \cs_new_protected:Npn \__enumext_keyans_unknown_keys:nn #1#2
3103   {
3104     \tl_if_blank:nTF {#2}
3105       {
3106         \msg_error:nnn { enumext } { keyans-unknown-key } {#1}
3107       }
3108       {
3109         \msg_error:nnnn { enumext } { keyans-unknown-key-value } {#1} {#2}
3110       }
3111   }
```

(*End of definition for* unknown *,* __enumext_keyans_unknown_keys:n*, and* __enumext_keyans_unknown_keys:nn*.*)

11.35.2 Handling unknown keys for enumext*

unknown
__enumext_starred_unknown_keys:n
__enumext_starred_unknown_keys:nn

Define and set unknown key for enumext* environment.

```
3112 \keys_define:nn { enumext / enumext* }
3113   {
3114     unknown .code:n = { \__enumext_starred_unknown_keys:n {#1} }
3115   }
```

Internal functions for handling unknown key.

```
3116 \cs_new_protected:Npn \__enumext_starred_unknown_keys:n #1
3117   {
3118     \exp_args:NV \__enumext_starred_unknown_keys:nn \l_keys_key_str {#1}
3119   }
3120 \cs_new_protected:Npn \__enumext_starred_unknown_keys:nn #1#2
```

```
3121    {
3122      \tl_if_blank:nTF {#2}
3123        {
3124          \msg_error:nnn { enumext } { starred-unknown-key } {#1}
3125        }
3126        {
3127          \msg_error:nnnn { enumext } { starred-unknown-key-value } {#1} {#2}
3128        }
3129    }
```

(*End of definition for* unknown *,* __enumext_starred_unknown_keys:n *, and* __enumext_starred_unknown_keys:nn*.*)

11.35.3 Handling unknown keys for enumext

unknown
__enumext_standar_unknown_keys:n
__enumext_standar_unknown_keys:nn

Defines and set the key unknown for enumext environment.

```
3130  \cs_set_protected:Npn \__enumext_tmp:n #1
3131    {
3132      \keys_define:nn { enumext / #1 }
3133        {
3134          unknown .code:n = { \__enumext_standar_unknown_keys:n {##1} }
3135        }
3136    }
3137  \clist_map_inline:nn { level-1,level-2,level-3,level-4 } { \__enumext_tmp:n {#1} }
```

Internal functions for handling unknown key.

```
3138  \cs_new_protected:Npn \__enumext_standar_unknown_keys:n #1
3139    {
3140      \exp_args:NV \__enumext_standar_unknown_keys:nn \l_keys_key_str {#1}
3141    }
3142  \cs_new_protected:Npn \__enumext_standar_unknown_keys:nn #1#2
3143    {
3144      \tl_if_blank:nTF {#2}
3145        {
3146          \msg_error:nnn { enumext } { standar-unknown-key } {#1}
3147        }
3148        {
3149          \msg_error:nnnn { enumext } { standar-unknown-key-value } {#1} {#2}
3150        }
3151    }
```

(*End of definition for* unknown *,* __enumext_standar_unknown_keys:n *, and* __enumext_standar_unknown_keys:nn*.*)

11.36 Redefining \item and \makelabel in keyans

The \item and \item[⟨*custom*⟩] commands work in the usual way in keyans, but the \item* and \item*[⟨*content*⟩] commands *store* the current ⟨*label*⟩ next to the ⟨*content*⟩ if it is present in the ⟨*sequence*⟩ and ⟨*prop list*⟩ defined by save-ans key.

__enumext_keyans_default_item:n

The function __enumext_keyans_default_item:n executes the original behavior of the \item.

```
3152  \cs_new_protected:Npn \__enumext_keyans_default_item:n #1
3153    {
3154      \tl_if_novalue:nTF { #1 }
3155        {
3156          \bool_set_true:N \l__enumext_wrap_label_v_bool
3157          \__enumext_item_std:w \tl_use:N \l__enumext_fake_item_indent_v_tl
3158        }
3159        {
3160          \bool_set_eq:NN \l__enumext_wrap_label_v_bool \l__enumext_wrap_label_opt_v_bool
3161          \__enumext_item_std:w [#1] \tl_use:N \l__enumext_fake_item_indent_v_tl
3162        }
3163    }
```

(*End of definition for* __enumext_keyans_default_item:n*.*)

__enumext_keyans_starred_item:n

The function __enumext_keyans_starred_item:n which will make a temporary copy of the current ⟨*label*⟩, execute the show-ans or show-pos keys using the function __enumext_keyans_show_left:n and will display the contents of that item using the internal copy __enumext_item_std:w, this is necessary to prevent incrementing the current "*counter*" of the original ⟨*label*⟩.

```
3164  \cs_new_protected:Npn \__enumext_keyans_starred_item:n #1
3165    {
3166      \tl_set_eq:NN \l__enumext_store_current_label_tmp_tl \l__enumext_label_v_tl
3167      \__enumext_keyans_show_left:n { #1 }
3168      \bool_set_true:N \l__enumext_wrap_label_v_bool
3169      \__enumext_item_std:w \tl_use:N \l__enumext_fake_item_indent_v_tl \__enumext_keyans_show_item
```

Recover the original value of the current ⟨*label*⟩ and *store* it first in the ⟨*prop list*⟩ (including the optional argument), run the internal *"label and ref"* system if the `save-ref` key is active and finally *store* it in the ⟨*sequence*⟩.

```
3170      \tl_set_eq:NN \l__enumext_label_v_tl \l__enumext_store_current_label_tmp_tl
3171      \__enumext_keyans_addto_prop:n { #1 }
3172      \__enumext_keyans_store_ref:
3173      \__enumext_keyans_addto_seq:n { #1 }
3174      \int_gincr:N \g__enumext_check_starred_cmd_int
3175    }
```

(*End of definition for* `\__enumext_keyans_starred_item:n`.)

`\item*`
`\__enumext_keyans_redefine_item:`
`\__enumext_keyans_make_label:`

The function `\__enumext_keyans_redefine_item:` is responsible for adding the *starred* and *optional* argument by the `\__enumext_list_arg_two_v:` function in the definition of the `keyans` environment. Here we need to use `\peek_remove_spaces:n` to prevent an unwanted space when using `\item*` in conjunction with the `itemindent` key.

```
3176  \cs_new_protected:Nn \__enumext_keyans_redefine_item:
3177    {
3178      \RenewDocumentCommand \item { s o }
3179        {
3180          \bool_if:nTF {##1}
3181            {
3182              \peek_remove_spaces:n
3183                {
3184                  \__enumext_keyans_starred_item:n {##2}
3185                }
3186            }
3187            {
3188              \__enumext_keyans_default_item:n {##2}
3189            }
3190        }
3191    }
```

The function `\__enumext_keyans_make_label:` redefine `\makelabel` for the keys `align`, `font`, `wrap-label`, `wrap-label*` and `\item*` for `keyans` environment.

```
3192  \cs_new_protected:Nn \__enumext_keyans_make_label:
3193    {
3194      \RenewDocumentCommand \makelabel { m }
3195        {
3196          \tl_use:N \l__enumext_label_fill_left_v_tl
3197          \tl_use:N \l__enumext_label_font_style_v_tl
3198          \bool_if:NTF \l__enumext_wrap_label_v_bool
3199            {
3200              \__enumext_wrapper_label_v:n { ##1 }
3201            }
3202            { ##1 }
3203          \tl_use:N \l__enumext_label_fill_right_v_tl
3204        }
3205    }
```

(*End of definition for* `\item*`, `\__enumext_keyans_redefine_item:`, *and* `\__enumext_keyans_make_label:`. *This function is documented on page 14.*)

🖋 This functions are passed to `\__enumext_list_arg_two_v:` used in the definition of the `keyans` environment (§11.37.2).

11.37   Second argument of the lists

At this point of the code we have already programmed most the necessary tools to create a custom `list` environment, remember that the function `\__enumext_start_list:nn` takes two arguments, the first one we have ready, the second one we will define for all the levels of the environment `enumext` and the environment `keyans`.

11.37.1   Calculation of `\leftmargin` and `\itemindent`

Consider the figure 9 where the default margins (on the left) of a list are represented.
The idea is to have control over these margins so that our list does not overlap the left margin of the page. The *key* relationship is that the right edge of the `\labelsep` equals the right edge of the `\itemindent`, so that the left edge of the *label box* is at `\leftmargin`+`\itemindent` minus `\labelwidth`+`\labelsep`. Thus, the handling of the margins by the package will be as shown in the figure 10.
Where the default values will look like in the figure 11.
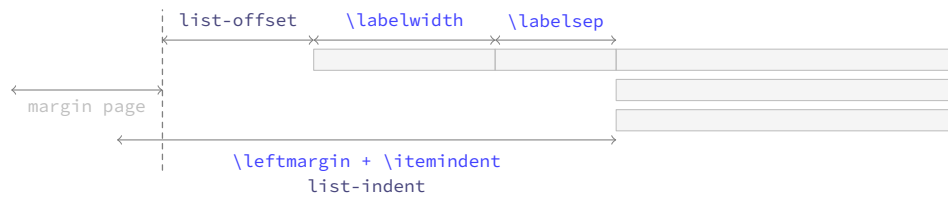
Figure 9: Representation of standard horizontal lengths in `list` environment.
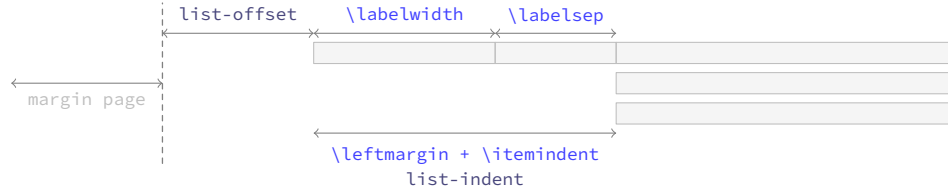
Figure 10: Representation of horizontal lengths concept in list in enumext.

`\__enumext_calc_hspace:NNNNNNN`

`\__enumext_calc_hspace:ccccccc`

The function `\__enumext_calc_hspace:NNNNNNN` takes seven arguments to be able to determine horizontal spaces for all list environment:

#1: `\l__enumext_labelwidth_X_dim`   #2: `\l__enumext_labelsep_X_dim`
#3: `\l__enumext_listoffset_X_dim`   #4: `\l__enumext_leftmargin_tmp_X_dim`
#5: `\l__enumext_leftmargin_X_dim`   #6: `\l__enumext_itemindent_X_dim`
#7: `\l__enumext_leftmargin_tmp_X_bool`

And returns the *"adjusted"* values of `\leftmargin` and `\itemindent`.

This function is passed to `\__enumext_list_arg_two_X:` which is used in the definition of the enumext and keyans environments (§11.37.2).

```
3206 \cs_new_protected:Npn \__enumext_calc_hspace:NNNNNNN #1 #2 #3 #4 #5 #6 #7
3207   {
3208     \dim_compare:nNnT { #1 } < { \c_zero_dim }
3209       {
3210         \msg_warning:nnnV { enumext } { width-non-positive }{ labelwidth }{ #1 }
3211         \dim_set:Nn #1 { \dim_abs:n { #1 } }
3212       }
3213     \dim_compare:nNnT { #2 } < { \c_zero_dim }
3214       {
3215         \msg_warning:nnnV { enumext } { width-negative }{ labelsep }{ #2 }
3216         \dim_set:Nn #2 { \dim_abs:n { #2 } }
3217       }
```

If no value has been passed to the `labelwidth` and `labelsep` keys we set the default values for `\l__enumext_leftmargin_tmp_X_dim`.

```
3218     \bool_if:nF #7 { \dim_set:Nn #4 { #1 + #2 } }
```

We now analyze the cases and set the values for `\leftmargin` and `\itemindent`.

```
3219     \dim_compare:nNnTF { #4 } < { \c_zero_dim }
3220       {
3221         \dim_set:Nn #6 { #1 + #2 - #4}
3222         \dim_set:Nn #5 { #1 + #2 + #3 - #6 }
3223       }
3224       {
3225         \dim_compare:nNnT { #4 } = { #1 + #2 }
3226           { \dim_set:Nn #6 { \c_zero_dim } }
3227         \dim_compare:nNnT { #4 } < { #1 + #2 }
3228           { \dim_set:Nn #6 { #1 + #2 - #4} }
3229         \dim_compare:nNnT { #4 } > { #1 + #2 }
3230           {
```
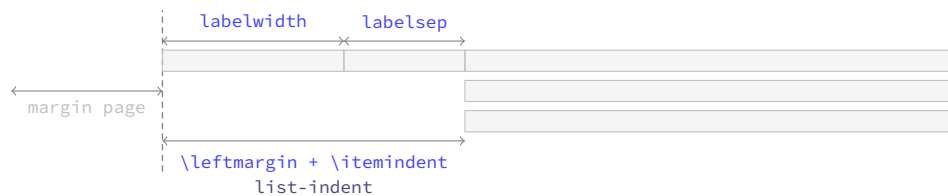

Figure 11: Default horizontal lengths in enumext.

```
3231                    \dim_set:Nn #6 { -#1 - #2 + #4}
3232                    \dim_set:Nn #6 { #6*-1}
3233                }
3234            \dim_set:Nn #5 { #1 + #2 + #3 - #6 }
3235        }
3236    }
3237 \cs_generate_variant:Nn \__enumext_calc_hspace:NNNNNNN { ccccccc }
```

(*End of definition for* __enumext_calc_hspace:NNNNNNN.)

11.37.2 Setting second argument of the lists

__enumext_list_arg_two_i:
__enumext_list_arg_two_ii:
__enumext_list_arg_two_iii:
__enumext_list_arg_two_iv:
__enumext_list_arg_two_v:

We will "not set" \leftmargini, \leftmarginii, \leftmarginiii or \leftmarginiv, in this case, we will directly set the parameters for vertical and horizontal list spacing per level.

```
3238 \cs_set_protected:Npn \__enumext_tmp:n #1
3239    {
3240        \cs_new_protected:cpn { __enumext_list_arg_two_#1: }
3241            {
3242                \__enumext_calc_hspace:ccccccc
3243                    { l__enumext_labelwidth_#1_dim } { l__enumext_labelsep_#1_dim }
3244                    { l__enumext_listoffset_#1_dim } { l__enumext_leftmargin_tmp_#1_dim }
3245                    { l__enumext_leftmargin_#1_dim } { l__enumext_itemindent_#1_dim }
3246                    { l__enumext_leftmargin_tmp_#1_bool }
3247                \clist_map_inline:nn
3248                    { labelsep, labelwidth, itemindent, leftmargin, rightmargin, listparindent }
3249                    { \dim_set_eq:cc {####1} { l__enumext_####1_#1_dim } }
3250                \clist_map_inline:nn { topsep, parsep, partopsep, itemsep }
3251                    { \skip_set_eq:cc {####1} { l__enumext_####1_#1_skip } }
3252                \usecounter { enumX#1 }
3253                \setcounter { enumX#1 } { \int_eval:n { \int_use:c { l__enumext_start_#1_int } - 1 } }
3254                \str_if_eq:nnTF {#1} { v }
3255                    {
3256                        \__enumext_keyans_redefine_item:
3257                        \__enumext_keyans_make_label:
3258                        \__enumext_keyans_ref:
3259                        \__enumext_keyans_fake_item:
3260                        \bool_if:cT { l__enumext_show_length_#1_bool }
3261                            {
3262                                \msg_term:nnnn { enumext } { list-lengths-not-nested } { v } { keyans }
3263                            }
3264                    }
3265                    {
3266                        \__enumext_redefine_item:
3267                        \__enumext_make_label:
3268                        \__enumext_standar_ref:
3269                        \__enumext_fake_item:
3270                        \bool_if:cT { l__enumext_show_length_#1_bool }
3271                            {
3272                                \msg_term:nnne { enumext } { list-lengths } {#1} { \int_use:N \l__enumext_level_i
3273                            }
3274                    }
3275            }
3276    }
3277 \clist_map_inline:nn { i, ii, iii, iv, v } { \__enumext_tmp:n {#1} }
```

(*End of definition for* __enumext_list_arg_two_i: *and others.*)

__enumext_list_arg_two_vii:
__enumext_list_arg_two_viii:

For the horizontal environments enumext* and keyans* the implementation is similar, but, the value of \partopsep is always 0pt. At this point we will modify the parsep key to make it take the value of the itemsep key and later, in the environment definition, we will modify parindent to make it set the value of lisparindent and parsep to set the value of \parskip locally.

```
3278 \cs_set_protected:Npn \__enumext_tmp:n #1
3279    {
3280        \cs_new_protected:cpn { __enumext_list_arg_two_#1: }
3281            {
3282                \bool_set_true:c { l__enumext_leftmargin_tmp_#1_bool }
3283                \dim_zero:c { l__enumext_leftmargin_tmp_#1_dim }
3284                \__enumext_calc_hspace:ccccccc
3285                    { l__enumext_labelwidth_#1_dim } { l__enumext_labelsep_#1_dim }
3286                    { l__enumext_listoffset_#1_dim } { l__enumext_leftmargin_tmp_#1_dim }
3287                    { l__enumext_leftmargin_#1_dim } { l__enumext_itemindent_#1_dim }
3288                    { l__enumext_leftmargin_tmp_#1_bool }
```

```
3289        \clist_map_inline:nn
3290          { labelsep, labelwidth, itemindent, leftmargin, rightmargin, listparindent }
3291          { \dim_set_eq:cc {####1} { l__enumext_####1_#1_dim } }
3292        \clist_map_inline:nn { topsep, parsep, partopsep, itemsep }
3293          { \skip_set_eq:cc {####1} { l__enumext_####1_#1_skip } }
3294        \skip_set_eq:Nc \parsep  { l__enumext_itemsep_#1_skip }
3295        \skip_zero:N \partopsep
3296        \usecounter { enumX#1 }
3297        \setcounter { enumX#1 } { \int_eval:n { \int_use:c { l__enumext_start_#1_int } - 1 } }
3298        \__enumext_starred_ref:
3299        \str_if_eq:nnTF {#1} { vii }
3300          {
3301            \__enumext_fake_item_vii:
3302            \bool_if:cT { l__enumext_show_length_vii_bool }
3303              { \msg_term:nnnn { enumext } { list-lengths-not-nested } { vii } { enumext* } }
3304          }
3305          {
3306            \__enumext_fake_item_viii:
3307            \bool_if:cT { l__enumext_show_length_#1_bool }
3308              { \msg_term:nnnn { enumext } { list-lengths-not-nested } { #1 } { keyans* } }
3309          }
3310        }
3311      }
3312    \clist_map_inline:nn { vii, viii } { \__enumext_tmp:n {#1} }
```

(*End of definition for* __enumext_list_arg_two_vii: *and* __enumext_list_arg_two_viii:*.*)

11.38   The environment enumext

enumext   We create the enumext environment based on list environment by levels.

```
3313    \NewDocumentEnvironment{enumext}{ O{} }
3314      {
3315        \__enumext_safe_exec:
3316        \__enumext_parse_keys:n {#1}
3317        \__enumext_before_list:
3318        \__enumext_start_store_level:
3319        \__enumext_start_list:nn
3320          { \tl_use:c { l__enumext_label_ \__enumext_level: _tl } }
3321          {
3322            \use:c { __enumext_list_arg_two_ \__enumext_level: : }
3323            \__enumext_before_keys_exec:
3324          }
3325        \__enumext_set_item_width:
3326        \__enumext_after_args_exec:
3327      }
3328      {
3329        \__enumext_stop_list:
3330        \__enumext_stop_store_level:
3331        \__enumext_after_list:
3332      }
```

(*End of definition for* enumext. *This function is documented on page* *4*.)

__enumext_set_item_width: The function __enumext_set_item_width: will set the value of \itemwidth taking into account the value established by the list-offset key for each level of the environment.

```
3333    \cs_new_protected:Nn \__enumext_set_item_width:
3334      {
3335        \dim_set:Nn \itemwidth
3336          {
3337            \linewidth
3338          }
3339        \dim_compare:nT
3340          {
3341            \dim_use:c { l__enumext_listoffset_ \__enumext_level: _dim } != \c_zero_dim
3342          }
3343          {
3344            \dim_sub:Nn \itemwidth
3345              {
3346                \dim_use:c { l__enumext_listoffset_ \__enumext_level: _dim }
3347              }
3348          }
3349      }
```

(*End of definition for* __enumext_set_item_width:*.*)

__enumext_safe_exec: The __enumext_safe_exec: function first call the function __enumext_internal_mini_page: to create the environment __enumext_mini_env*, then the function __enumext_is_not_nested: which sets \g__enumext_standar_bool to *"true"* if we are not nested within enumext*, we will increment \l__enumext_level_int to restrict nesting of the environment, set \l__enumext_standar_bool to *"true"* and finally call the function __enumext_is_on_first_level: which sets \l__enumext_standar_first_bool to *"true"* only if the environment is not nested and we are at the *"first level"*.

```
3350  \cs_new_protected:Nn \__enumext_safe_exec:
3351    {
3352      \__enumext_internal_mini_page:
3353      \__enumext_is_not_nested:
3354      \int_incr:N \l__enumext_level_int
3355      \int_compare:nNnT { \l__enumext_level_int } > { 4 }
3356        { \msg_fatal:nn { enumext } { list-too-deep } }
3357      \bool_set_true:N \l__enumext_standar_bool
3358      \bool_set_false:N \l__enumext_starred_bool
3359      \__enumext_is_on_first_level:
3360    }
```

(*End of definition for* __enumext_safe_exec:*.*)

__enumext_parse_keys:n The __enumext_parse_store_keys:n function first we will clear the variable \l__enumext_series_str used by the key series and then we check if we are at the *"first level"*, if so we process the ⟨*keys*⟩ and then execute the function __enumext_parse_series:n used by the key series and call the function __enumext_nested_base_line_fix: used by the key base-fix, otherwise we will pass the ⟨*keys*⟩ to the inner levels of the environment then we execute the function __enumext_store_active_keys:n and reprocess the ⟨*keys*⟩ to pass them to the storage ⟨*sequence*⟩ if the key save-key is not active.

```
3361  \cs_new_protected:Npn \__enumext_parse_keys:n #1
3362    {
3363      \tl_if_novalue:nF {#1}
3364        {
3365          \str_clear:N \l__enumext_series_str
3366          \int_compare:nNnTF { \l__enumext_level_int } = { 1 }
3367            {
3368              \keys_set:nn { enumext / level-1 } {#1}
3369              \__enumext_parse_series:n {#1}
3370              \__enumext_nested_base_line_fix:
3371            }
3372            {
3373              \exp_args:Ne \keys_set:nn
3374                { enumext / level-\int_use:N \l__enumext_level_int } {#1}
3375            }
3376          \__enumext_store_active_keys:n {#1}
3377        }
3378    }
```

(*End of definition for* __enumext_parse_keys:n*.*)

__enumext_start_store_level: The __enumext_start_store_level: and __enumext_stop_store_level: functions activate the
__enumext_stop_store_level: level saving mechanism for storage in ⟨*sequence*⟩ for the command \anskey and the environment anskey*.

```
3379  \cs_new_protected:Nn \__enumext_start_store_level:
3380    {
3381      \bool_lazy_all:nT
3382        {
3383          { \bool_if_p:N \l__enumext_store_active_bool }
3384          { \bool_not_p:n { \l__enumext_keyans_env_bool } }
3385          { \bool_if_p:N \g__enumext_standar_bool }
3386        }
3387        {
3388          \int_compare:nNnT { \l__enumext_level_int } > { 1 }
3389            {
3390              \bool_set_true:c { l__enumext_store_upper_level_ \__enumext_level: _bool }
3391              \__enumext_store_level_open:
3392            }
3393        }
```

If enumext are nested in enumext* add __enumext_store_level_open: to preserve the stored structure.

```
3394        \bool_lazy_all:nT
3395          {
3396            { \bool_if_p:N \l__enumext_store_active_bool }
3397            { \bool_not_p:n { \l__enumext_keyans_env_bool } }
3398            { \int_compare_p:nNn { \l__enumext_level_h_int } = { 1 } }
3399          }
3400          {
3401            \int_compare:nNnT { \l__enumext_level_int } > { 0 }
3402              {
3403                \bool_set_true:c { l__enumext_store_upper_level_ \__enumext_level: _bool }
3404                \__enumext_store_level_open:
3405              }
3406          }
3407      }
```

Close the stored structure.

```
3408  \cs_new_protected:Nn \__enumext_stop_store_level:
3409    {
3410      \bool_if:cT { l__enumext_store_upper_level_ \__enumext_level: _bool }
3411        {
3412          \__enumext_store_level_close:
3413        }
3414    }
```

(*End of definition for* __enumext_start_store_level: *and* __enumext_stop_store_level:*.*)

__enumext_before_list: The function __enumext_before_list: first calls the function __enumext_vspace_above: used by the keys above and above*, then calls the function __enumext_before_args_exec: used by the key before* and finally execute the function __enumext_check_ans_active: for the check answer mechanism.

```
3415  \cs_new_protected:Nn \__enumext_before_list:
3416    {
3417      \__enumext_vspace_above:
3418      \__enumext_before_args_exec:
3419      \__enumext_check_ans_active:
```

When the mini-env key is active it will set the value of the \l__enumext_minipage_right_X_dim to be the *width* of the __enumext_mini_env* environment on the *"right side"*, using this value together with the value of the \l__enumext_minipage_hsep_X_dim set by the mini-sep key, the value of \l__enumext_minipage_left_X_dim will be set, which will be the *width* of __enumext_mini_env* environment on the *"left side"*, always having a current \linewidth as *maximum width* between them.

```
3420        \dim_compare:nNnT
3421          { \dim_use:c { l__enumext_minipage_right_ \__enumext_level: _dim } } > { \c_zero_dim }
3422          {
3423            \dim_set:cn { l__enumext_minipage_left_ \__enumext_level: _dim }
3424              {
3425                \linewidth
3426                - \dim_use:c { l__enumext_minipage_right_ \__enumext_level: _dim }
3427                - \dim_use:c { l__enumext_minipage_hsep_ \__enumext_level: _dim }
3428              }
```

The boolean variable \l__enumext_minipage_active_X_bool will be activated and the integer variable \g__enumext_minipage_stat_int used by the \miniright command will be incremented, then the function __enumext_mini_addvspace: is called and the __enumext_mini_env* environment on the *"left side"* will be initialized followed by the *"vertical spacing"* applied to preserve the *"baseline"* between the *left* and *right* side environments. After these actions, the function __enumext_multicols_start: is called to handle the multicols environment.

💣 Here we use the plain TEX macro \nointerlineskip to prevent baseline *"glue"* being added between the next pair of boxes in a *vertical list*.

```
3429          \bool_set_true:c { l__enumext_minipage_active_ \__enumext_level: _bool }
3430          \int_gincr:N \g__enumext_minipage_stat_int
3431          \__enumext_mini_addvspace:
3432          \nointerlineskip\noindent
3433          \begin{__enumext_mini_env*}
3434            { \dim_use:c { l__enumext_minipage_left_ \__enumext_level: _dim } }
3435        }
3436      \__enumext_multicols_start:
3437    }
```

(*End of definition for* __enumext_before_list:.)

__enumext_multicols_start:

The function __enumext_multicols_start: will start the multicols environment according to the value passed by the columns key, then set the default value for \columnsep when columns-sep=0pt and set the value of \multicolsep equal to zero and leave \columnseprule equal to zero for inner levels.

```
3438 \cs_new_protected:Nn \__enumext_multicols_start:
3439   {
3440     \int_compare:nNnT
3441       { \int_use:c { l__enumext_columns_ \__enumext_level: _int } } > { 1 }
3442       {
3443         \dim_compare:nNnT
3444           { \dim_use:c { l__enumext_columns_sep_ \__enumext_level: _dim } } = { \c_zero_dim }
3445           {
3446             \dim_set:cn { l__enumext_columns_sep_ \__enumext_level: _dim }
3447               {
3448                 ( \dim_use:c { l__enumext_labelwidth_ \__enumext_level: _dim }
3449                 + \dim_use:c { l__enumext_labelsep_ \__enumext_level: _dim }
3450                 ) / \int_use:c { l__enumext_columns_ \__enumext_level: _int }
3451                 - \dim_use:c { l__enumext_listoffset_ \__enumext_level: _dim }
3452               }
3453           }
3454         \dim_set_eq:Nc \columnsep { l__enumext_columns_sep_ \__enumext_level: _dim  }
3455         \skip_zero:N \multicolsep
3456         \int_compare:nNnT { \l__enumext_level_int } > { 1 }
3457           {
3458             \dim_zero:N \columnseprule
3459           }
```

We will calculate the *vertical spacing* settings for the multicols environment using the function __enumext_multi_addvspace:, apply our *"vertical adjust spacing"*, then start the multicols environment.

```
3460         \bool_if:cF { l__enumext_minipage_active_ \__enumext_level: _bool }
3461           {
3462             \__enumext_multi_addvspace:
3463           }
3464         \raggedcolumns
3465         \begin{multicols}{ \int_use:c { l__enumext_columns_ \__enumext_level: _int } }
3466       }
3467   }
```

(*End of definition for* __enumext_multicols_start:.)

__enumext_multicols_stop:

The function __enumext_multicols_stop: will stop the multicols environment. If the boolean variable \l__enumext_minipage_active_X_bool is false (not nested in __enumext_mini_env*) we will apply our *"vertical adjust"* spacing.

```
3468 \cs_new_protected:Nn \__enumext_multicols_stop:
3469   {
3470     \int_compare:nNnT
3471       { \int_use:c { l__enumext_columns_ \__enumext_level: _int } } > { 1 }
3472       {
3473         \end{multicols}
3474         \bool_if:cF { l__enumext_minipage_active_ \__enumext_level: _bool }
3475           {
3476             \par\addvspace{ \skip_use:c { l__enumext_multicols_below_ \__enumext_level: _skip } }
3477           }
3478       }
3479   }
```

(*End of definition for* __enumext_multicols_stop:.)

__enumext_after_list:

The function __enumext_after_list: first check the state of the boolean variable \l__enumext_-minipage_active_X_bool, if it is "true" a small test will be executed to check if we have omitted the use of \miniright (the __enumext_mini_env* environment has not been closed), then close __enumext_-mini_env* and add the *adjusted vertical space* \l__enumext_minipage_after_skip, otherwise we will close the multicols environment.

```
3480 \cs_new_protected:Nn \__enumext_after_list:
3481   {
3482     \bool_if:cTF { l__enumext_minipage_active_ \__enumext_level: _bool }
3483       {
```

```
3484        \int_compare:nNnT { \g__enumext_minipage_stat_int } = { 1 }
3485          {
3486            \msg_warning:nn { enumext } { missing-miniright }
3487            \miniright
3488          }
3489        \int_gzero:N \g__enumext_minipage_stat_int
3490        \end{__enumext_mini_env*}
3491        \par\addvspace { \l__enumext_minipage_after_skip }
3492      }
3493    { \__enumext_multicols_stop: }
```

Now we will execute the functions __enumext_after_stop_list: used by the key after, __enumext_-check_ans_key_hook: used by the key check-ans, __enumext_vspace_below: used by the keys below and below*. Finally set \l__enumext_standar_bool to false and call the function __enumext_-resume_save_counter: used by the series, resume and resume* keys.

```
3494      \__enumext_after_stop_list:
3495      \__enumext_check_ans_key_hook:
3496      \__enumext_vspace_below:
3497      \bool_set_false:N \l__enumext_standar_bool
3498      \__enumext_resume_save_counter:
3499    }
```

As we don't want our check to be executed check-ans by levels but on the complete list, we will take it out of the enumext environment using the *"hook"* function __enumext_after_env:nn.

```
3500 \__enumext_after_env:nn {enumext} { \__enumext_execute_after_env: }
```

(*End of definition for* __enumext_after_list:.)

11.39 The environment keyans

The environment keyans also based on lists. The main differences with the enumext environment are the *nesting* and the way the *answers* (choice) will be stored and checked, this environment is intended exclusively for *"multiple choice questions"*.

keyans   Now we define the environment keyans also based on lists.

```
3501 \NewDocumentEnvironment{keyans}{ O{} }
3502    {
3503      \__enumext_keyans_safe_exec:
3504      \__enumext_keyans_parse_keys:n {#1}
3505      \__enumext_before_list_v:
3506      \__enumext_start_list:nn
3507        { \tl_use:N \l__enumext_label_v_tl }
3508        {
3509          \__enumext_list_arg_two_v:
3510          \__enumext_before_keys_exec_v:
3511        }
3512      \__enumext_keyans_set_item_width:
3513      \__enumext_after_args_exec_v:
3514    }
3515    {
3516      \__enumext_check_starred_cmd:n { item }
3517      \__enumext_stop_list:
3518      \__enumext_after_list_v:
3519    }
```

(*End of definition for* keyans. *This function is documented on page* 14.)

__enumext_keyans_set_item_width: The function __enumext_keyans_set_item_width: will set the value of \itemwidth taking into account the value established by the list-offset key.

```
3520 \cs_new_protected:Nn \__enumext_keyans_set_item_width:
3521    {
3522      \dim_set:Nn \itemwidth
3523        {
3524          \linewidth
3525        }
3526      \dim_compare:nT
3527        {
3528          \l__enumext_listoffset_v_dim != \c_zero_dim
3529        }
3530        {
3531          \dim_sub:Nn \itemwidth
3532            {
```

```
3533                \l__enumext_listoffset_v_dim
3534              }
3535          }
3536      }
```

(*End of definition for* __enumext_keyans_set_item_width:.)

__enumext_keyans_safe_exec: The keyans environment will only be available if the save-ans key is active and can only be used at the *"first level"* within the enumext environment. We do not want the environment to be nested, so we will set a maximum at this point. If the conditions are not met, an error message will be returned.

```
3537  \cs_new_protected:Nn \__enumext_keyans_safe_exec:
3538    {
3539      \bool_if:NF \l__enumext_store_active_bool
3540        {
3541          \msg_error:nnnn { enumext } { wrong-place }{ keyans }{ save-ans }
3542        }
3543      \int_incr:N \l__enumext_keyans_level_int
3544      \bool_set_true:N \l__enumext_keyans_env_bool
3545      \__enumext_keyans_name_and_start:
3546      % Set false for interfering with enumext nested in keyans (yes, its possible and crayze)
3547      \bool_set_false:N \l__enumext_store_active_bool
3548      \int_compare:nNnT { \l__enumext_keyans_level_int } > { 1 }
3549        {
3550          \msg_error:nn { enumext } { keyans-nested }
3551        }
3552      \int_compare:nNnT { \l__enumext_level_int } > { 1 }
3553        {
3554          \msg_error:nn { enumext } { keyans-wrong-level }
3555        }
3556    }
```

(*End of definition for* __enumext_keyans_safe_exec:.)

__enumext_keyans_parse_keys:n   Parse [⟨*key* = *val*⟩] for keyans environment.

```
3557  \cs_new_protected:Npn \__enumext_keyans_parse_keys:n #1
3558    {
3559      \keys_set:nn { enumext / keyans } {#1}
3560    }
```

(*End of definition for* __enumext_keyans_parse_keys:n.)

__enumext_before_list_v:
__enumext_keyans_multicols_start:
__enumext_keyans_multicols_stop:
__enumext_after_list_v:

Same implementation as the one used in the enumext environment.

```
3561  \cs_new_protected:Nn \__enumext_before_list_v:
3562    {
3563      \__enumext_vspace_above_v:
3564      \__enumext_before_args_exec_v:
3565      \dim_compare:nNnT { \l__enumext_minipage_right_v_dim } > { \c_zero_dim }
3566        {
3567          \dim_set:Nn \l__enumext_minipage_left_v_dim
3568            {
3569              \linewidth - \l__enumext_minipage_right_v_dim - \l__enumext_minipage_hsep_v_dim
3570            }
3571          \bool_set_true:N \l__enumext_minipage_active_v_bool
3572          \int_gincr:N \g__enumext_minipage_stat_int
3573          \__enumext_keyans_mini_addvspace:
3574          \nointerlineskip\noindent
3575          \begin{__enumext_mini_env*}{ \l__enumext_minipage_left_v_dim }
3576        }
3577      \__enumext_keyans_multicols_start:
3578    }
3579  \cs_new_protected:Nn \__enumext_keyans_multicols_start:
3580    {
3581      \int_compare:nNnT { \l__enumext_columns_v_int } > { 1 }
3582        {
3583          \dim_compare:nNnT { \l__enumext_columns_sep_v_dim } = { \c_zero_dim }
3584            {
3585              \dim_set:Nn \l__enumext_columns_sep_v_dim
3586                {
3587                  (
3588                    \l__enumext_labelwidth_v_dim + \l__enumext_labelsep_v_dim
3589                  ) / \l__enumext_columns_v_int
```

```
3590                  - \l__enumext_listoffset_v_dim
3591                }
3592            }
3593        \dim_set_eq:NN \columnsep \l__enumext_columns_sep_v_dim
3594        \skip_zero:N \multicolsep
3595        \dim_zero:N \columnseprule % no rule here
3596        \bool_if:NF \l__enumext_minipage_active_v_bool
3597          {
3598            \__enumext_keyans_multi_addvspace:
3599          }
3600        \raggedcolumns
3601        \begin{multicols}{ \l__enumext_columns_v_int }
3602      }
3603  }
3604 \cs_new_protected:Nn \__enumext_keyans_multicols_stop:
3605  {
3606    \int_compare:nNnT { \l__enumext_columns_v_int } > { 1 }
3607      {
3608        \end{multicols}
3609        \bool_if:NF \l__enumext_minipage_active_v_bool
3610          {
3611            \par\addvspace{ \l__enumext_multicols_below_v_skip }
3612          }
3613      }
3614  }
3615 \cs_new_protected:Nn \__enumext_after_list_v:
3616  {
3617    \bool_if:NTF \l__enumext_minipage_active_v_bool
3618      {
3619        \int_compare:nNnT { \g__enumext_minipage_stat_int } = { 1 }
3620          {
3621            \msg_warning:nn { enumext } { missing-miniright }
3622            \miniright
3623          }
3624        \int_gzero:N \g__enumext_minipage_stat_int
3625        \end{__enumext_mini_env*}
3626        \par\addvspace{ \l__enumext_minipage_after_skip }
3627      }
3628      {
3629        \__enumext_keyans_multicols_stop:
3630      }
3631    \bool_set_false:N \l__enumext_keyans_env_bool
3632    \__enumext_after_stop_list_v:
3633    \__enumext_vspace_below_v:
3634  }
```

(*End of definition for* __enumext_before_list_v: *and others.*)

11.40   The environment keyanspic and \anspic

The keyanspic environment is a list-based environment that uses the same configuration for *"spacing"* and ⟨*label*⟩ as the keyans environment, but it does not use \item.

The contents are passed to the environment by means of the \anspic command and are placed inside minipage environments, with the ⟨*label*⟩ underneath, adjusting widths according to the options passed to the environment.

Again it is necessary to "adjust" the spacing, both vertical and horizontal, to obtain an output like the one shown in the figure 12.
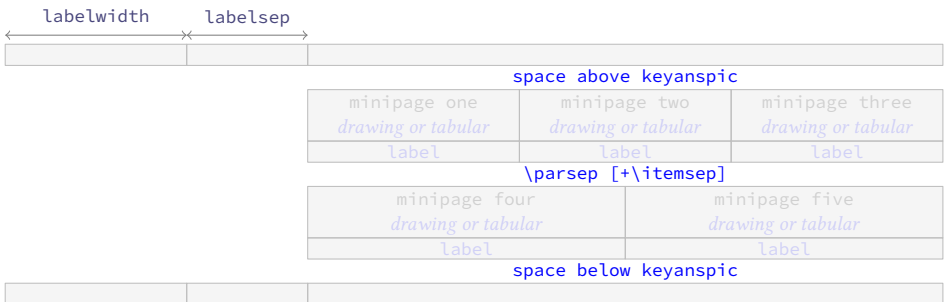
Figure 12: Representation of the keyanspic spacing in enumext.

This implementation is adapted from the answer given by Enrico Gregorio in How to process the body of an environment and divide it by a \macro?.

11.40.1 The command \anspic

\anspic

The \anspic command take three arguments, the starred (*) versions \anspic* and \anspic*[⟨*content*⟩] store the current ⟨*label*⟩ next to the [⟨*content*⟩] if it is present in the ⟨*sequence*⟩ and ⟨*prop list*⟩ defined by save-ans key. This command is used as a replacement for \item in the keyanspic environment.

```
3635  \NewDocumentCommand \anspic { s o +m }
3636    {
```

We check that the command is active in the keyanspic environment only if the save-ans key is present, otherwise we return an error.

```
3637    \bool_if:NF \l__enumext_store_active_bool
3638      {
3639        \msg_error:nnnn { enumext } { wrong-place }{ keyanspic }{ save-ans }
3640      }
3641    \int_compare:nNnT { \l__enumext_level_int } > { 1 }
3642      {
3643        \msg_error:nn { enumext } { keyanspic-wrong-level }
3644      }
3645    \int_compare:nNnT { \l__enumext_keyans_level_int } = { 1 }
3646      {
3647        \msg_error:nnnn { enumext } { command-wrong-place }{ anspic }{ keyans }
3648      }
```

The three arguments are handled by the function __enumext_keyans_anspic_code:nnn and stored in the sequence \l__enumext_keyans_pic_body_seq which is processed by the keyanspic environment.

```
3649    \seq_put_right:Nn \l__enumext_keyans_pic_body_seq
3650      {
3651        \__enumext_keyans_anspic_code:nnn { #1 } { #2 } { #3 }
3652      }
3653    }
```

(*End of definition for* \anspic*. This function is documented on page* 15*.*)

__enumext_keyans_anspic_code:nnn

The function __enumext_keyans_anspic_code:nnn will be in charge of handling the *"counter"* and ⟨*label*⟩, which will have the same configuration as the keyans environment.

```
3654  \cs_new_protected:Nn \__enumext_keyans_anspic_code:nnn
3655    {
3656      \stepcounter { enumXvi }
3657      #3 \\
3658      \bool_if:nT { #1 }
3659        {
3660          \__enumext_keyans_addto_prop:n { #2 }
3661          \__enumext_keyans_store_ref:
3662          \__enumext_keyans_addto_seq:n { #2 }
3663          \int_gincr:N \g__enumext_check_starred_cmd_int
3664          \bool_lazy_or:nnT
3665            { \bool_if_p:N \l__enumext_show_answer_bool }
3666            { \bool_if_p:N \l__enumext_show_position_bool }
3667            {
3668              \tl_set_eq:NN \l__enumext_label_v_tl \l__enumext_label_vi_tl
3669              \__enumext_keyans_show_left:n { #2 }
3670              \tl_set_eq:NN \l__enumext_label_vi_tl \l__enumext_label_v_tl
3671            }
3672        }
3673      \tl_use:N \l__enumext_label_font_style_v_tl
3674      \__enumext_wrapper_label_v:n { \l__enumext_label_vi_tl } \__enumext_keyans_show_item_opt:
3675    }
```

(*End of definition for* __enumext_keyans_anspic_code:nnn*.*)

11.40.2 The environment keyanspic

keyanspic

Now we define the environment keyanspic based on list. The optional argument [⟨*number above, number below*⟩] will determine the number of minipage environments that will be above and below separated by \parsep+\itemsep within it.

```
3676  \NewDocumentEnvironment{keyanspic}{ o }
3677    {
3678      \__enumext_keyans_pic_safe_exec:
3679      \__enumext_start_list:nn
3680        { }
3681        {
```

```
3682        \__enumext_keyans_pic_arg_two:
3683        }
```

We apply the "adjusted" vertical spacing above the environment

```
3684      \vspace { \l__enumext_keyans_pic_above_skip }
3685    }
```

If the optional argument is not present, the number of times the \anspic command appears will be counted from \l__enumext_keyans_pic_body_seq and placed in minipage environments on a single line. Finally we check if \anspic* has been used, set the counter to zero and apply our "adjusted" vertical space below the environment.

```
3686    {
3687      \tl_if_novalue:nTF { #1 }
3688        {
3689          \__enumext_keyans_pic_do:e { \seq_count:N \l__enumext_keyans_pic_body_seq }
3690        }
3691        { \__enumext_keyans_pic_do:n { #1 } }
3692      \__enumext_stop_list:
3693      \__enumext_check_starred_cmd:n { anspic }
3694      \setcounter { enumXvi } { 0 }
3695      \vspace { \l__enumext_topsep_v_skip }
3696      %\bool_set_false:N \l__enumext_store_active_bool
3697    }
```

(*End of definition for* keyanspic. *This function is documented on page 15.*)

__enumext_keyans_pic_safe_exec: The function __enumext_keyans_pic_safe_exec: check nested and level position inside the enumext environment.

```
3698  \cs_new_protected:Nn \__enumext_keyans_pic_safe_exec:
3699    {
3700      \int_incr:N \l__enumext_keyans_pic_level_int
3701      \int_compare:nNnT { \l__enumext_keyans_pic_level_int } > { 1 }
3702        {
3703          \msg_error:nn { enumext } { keyanspic-nested }
3704        }
3705      \__enumext_keyans_name_and_start:
3706    }
```

(*End of definition for* __enumext_keyans_pic_safe_exec:.)

__enumext_keyans_pic_skip_abs:N   The function __enumext_keyans_pic_skip_abs:N will return a positive value \parsep.

```
3707  \cs_new_protected:Npn \__enumext_keyans_pic_skip_abs:N #1
3708    {
3709      \dim_compare:nNnT { #1 } < { 0pt }
3710        { \skip_set:Nn #1 { -#1 } }
3711    }
```

(*End of definition for* __enumext_keyans_pic_skip_abs:N.)

__enumext_keyans_pic_arg_two: The function __enumext_keyans_pic_arg_two: will be used in the second argument of the __enumext_-start_list:nn function that defines the keyanspic environment, it will handle the setting of spaces.

```
3712  \cs_new_protected:Nn \__enumext_keyans_pic_arg_two:
3713    {
```

The first thing to do is to set the boolean variable \l__enumext_leftmargin_tmp_v_bool handled by the list-indent key to false, then we copy the definition of the second list argument from the keyans environment.

```
3714      \bool_set_false:N \l__enumext_leftmargin_tmp_v_bool
3715      \__enumext_list_arg_two_v:
```

We will add the value of \itemsep to \parsep which we will use as vertical spacing between the above and below minipage environments. and adjust the value of \leftmargin, the label and counter are handled directly by the \anspic command. Then we make equal to zero \labelwidth, \labelsep, \partopsep and \itemsep so that the horizontal and vertical spacing is not affected.

```
3716      \skip_add:Nn \parsep { \itemsep }
3717      \dim_add:Nn  \leftmargin { -\labelwidth - \labelsep }
3718      \dim_zero:N  \labelwidth
3719      \dim_zero:N  \listparindent
3720      \dim_zero:N  \labelsep
3721      \skip_zero:N \partopsep
3722      \skip_zero:N \itemsep
```

We set the value of `\l__enumext_keyans_pic_above_skip` which we will use to apply our "adjust" space above `keyanspic`, finally we call `\__enumext_item_std:w` followed by `\scan_stop:` to prevent the error message returned by LaTeX when not using the `\item` command.

```
3723    \__enumext_keyans_pic_skip_abs:N \parsep
3724    \skip_set:Nn \l__enumext_keyans_pic_above_skip
3725      {
3726        \box_dp:N \strutbox
3727        + \l__enumext_topsep_v_skip
3728        - \parsep
3729      }
3730    \__enumext_item_std:w \scan_stop:
3731    % paranoia
3732    \RenewDocumentCommand \item {}
3733      {
3734        \msg_error:nn { enumext } { keyanspic-item-cmd }
3735      }
3736  }
```

(*End of definition for* `\__enumext_keyans_pic_arg_two:`.)

`\__enumext_keyans_pic_do:n`
`\__enumext_keyans_pic_do:e`

The optional argument is split by comma and is handled directly by the function `\__enumext_keyans_pic_do:n` and passed to the function `\__enumext_keyans_pic_row:n`.

```
3737  \cs_new_protected:Nn \__enumext_keyans_pic_do:n
3738    {
3739      \clist_map_function:nN { #1 } \__enumext_keyans_pic_row:n
3740    }
3741  \cs_generate_variant:Nn \__enumext_keyans_pic_do:n { e }
```

(*End of definition for* `\__enumext_keyans_pic_do:n`.)

`\__enumext_keyans_pic_row:n`

The function `\__enumext_keyans_pic_row:n` will set the widths for the `minipage` environments and place the content ⟨*stored*⟩ by `\anspic*` in the `\l__enumext_keyans_pic_body_seq` sequence inside them.

```
3742  \cs_new_protected:Nn \__enumext_keyans_pic_row:n
3743    {
3744      \dim_set:Nn \l__enumext_keyans_pic_width_dim { \linewidth / #1 }
3745      \int_set:Nn \l__enumext_keyans_pic_above_int { \l__enumext_keyans_pic_below_int }
3746      \int_set:Nn \l__enumext_keyans_pic_below_int { \l__enumext_keyans_pic_above_int + #1 }
3747      \int_step_inline:nnn
3748        { \l__enumext_keyans_pic_above_int + 1 }
3749        { \l__enumext_keyans_pic_below_int }
3750        {
3751          \__enumext_minipage:w [ b ]{ \l__enumext_keyans_pic_width_dim }
3752            \centering
3753            \seq_item:Nn \l__enumext_keyans_pic_body_seq { ##1 }
3754          \__enumext_endminipage:
3755        }
3756      \par
3757    }
```

(*End of definition for* `\__enumext_keyans_pic_row:n`.)

11.41 The horizontal environments

Generating horizontal list environments is NOT as simple as standard LaTeX list environments. The fundamental part of the code is adapted from the `shortlst` package to a more modern version using `expl3`. It is not possible to redefine `\item` and `\makelabel` as in the non starred versions (at least I have not achieved it) and as we will make it behave differently, we have no other option than to define a cascade of functions.

11.42 Redefining `\footnote` command

`\__enumext_footnotetext:nn`
`\__enumext_renew_footnote:`
`\__enumext_print_footnote:`

To keep the correct numbering of `\footnote` and to make it work correctly in the `enumext*` and `keyans*` environments, it is necessary to redefine the command. This implementation is adapted from the answer given by Clea F. Rees (@cfr) in footnotes in boxes compatible with hyperref.

```
3758  \cs_new_protected:Nn \__enumext_footnotetext:nn
3759    {
3760      \footnotetext[#1]{#2}
3761    }
3762  \cs_new_protected:Nn \__enumext_renew_footnote:
3763    {
```

```
3764         \seq_gclear:N \g__enumext_footnote_arg_seq
3765         \seq_gclear:N \g__enumext_footnote_int_seq
3766         \RenewDocumentCommand \footnote { o +m }
3767           {
3768             \tl_if_novalue:nTF {##1}
3769               {
3770                 \stepcounter{footnote}
3771                 \int_gset_eq:Nc \g__enumext_footnote_int { c@footnote }
3772               }
3773               {
3774                 \int_gset:Nn \g__enumext_footnote_int { ##1 }
3775               }
3776             \footnotemark [ \g__enumext_footnote_int ]
3777             \seq_gput_right:Nn \g__enumext_footnote_arg_seq { ##2 }
3778             \seq_gput_right:NV \g__enumext_footnote_int_seq \g__enumext_footnote_int
3779           }
3780       }
3781   \cs_new_protected:Nn \__enumext_print_footnote:
3782     {
3783       \seq_if_empty:NF \g__enumext_footnote_int_seq
3784         {
3785           \seq_map_pairwise_function:NNN
3786             \g__enumext_footnote_int_seq
3787             \g__enumext_footnote_arg_seq
3788             \__enumext_footnotetext:nn
3789         }
3790     }
```

(*End of definition for* `\__enumext_footnotetext:nn`, `\__enumext_renew_footnote:`, *and* `\__enumext_print_footnote:`.)

11.42.1 Functions for item box width

To achieve the horizontal list environment we will capture the `\item` command and the content of this in an plain `lrbox` box using `\makebox` for the `label` and a `minipage` environment for the content passed to `\item`, we will also add the optional argument ($\langle number \rangle$) to `\item` to be able to *join columns* horizontally, in simple terms, we want `\item` to behave in the same way as in the `enumext` environment but adding an optional first argument ($\langle number \rangle$).

`\__enumext_starred_columns_set_vii:`
`\__enumext_starred_columns_set_viii:`

We set the default value for the *width of the box* containing the content of the items for `enumext*` environment.

```
3791   \cs_new_protected:Nn \__enumext_starred_columns_set_vii:
3792     {
3793       \dim_compare:nNnT { \l__enumext_columns_sep_vii_dim } = { \c_zero_dim }
3794         {
3795           \dim_set:Nn \l__enumext_columns_sep_vii_dim
3796             {
3797               ( \l__enumext_labelwidth_vii_dim + \l__enumext_labelsep_vii_dim )
3798               / \l__enumext_columns_vii_int
3799             }
3800         }
3801       \int_set:Nn \l__enumext_tmpa_vii_int { \l__enumext_columns_vii_int - 1 }
3802       \dim_set:Nn \l__enumext_item_width_vii_dim
3803         {
3804           ( \linewidth - \l__enumext_columns_sep_vii_dim * \l__enumext_tmpa_vii_int )
3805           / \l__enumext_columns_vii_int
3806           - \l__enumext_labelwidth_vii_dim
3807           - \l__enumext_labelsep_vii_dim
3808         }
```

When the key `rightmargin` is active we must adjust the values.

```
3809       \dim_compare:nNnT { \l__enumext_rightmargin_vii_dim } > { \c_zero_dim }
3810         {
3811           \dim_sub:Nn \l__enumext_item_width_vii_dim
3812             {
3813               ( \l__enumext_rightmargin_vii_dim * \l__enumext_tmpa_vii_int )
3814               / \l__enumext_columns_vii_int
3815             }
3816           \dim_add:Nn \l__enumext_columns_sep_vii_dim
3817             {
3818               \l__enumext_rightmargin_vii_dim
3819             }
3820         }
3821       }
```

Same implementation for the `keyans*` environment.

```
3822  \cs_new_protected:Nn \__enumext_starred_columns_set_viii:
3823    {
3824      \dim_compare:nNnT { \l__enumext_columns_sep_viii_dim } = { \c_zero_dim }
3825        {
3826          \dim_set:Nn \l__enumext_columns_sep_viii_dim
3827            {
3828              ( \l__enumext_labelwidth_viii_dim + \l__enumext_labelsep_viii_dim )
3829              / \l__enumext_columns_viii_int
3830            }
3831        }
3832      \int_set:Nn \l__enumext_tmpa_viii_int { \l__enumext_columns_viii_int - 1 }
3833      \dim_set:Nn \l__enumext_item_width_viii_dim
3834        {
3835          ( \linewidth - \l__enumext_columns_sep_viii_dim * \l__enumext_tmpa_viii_int )
3836          / \l__enumext_columns_viii_int
3837          - \l__enumext_labelwidth_viii_dim
3838          - \l__enumext_labelsep_viii_dim
3839        }
3840      \dim_compare:nNnT { \l__enumext_rightmargin_viii_dim } > { \c_zero_dim }
3841        {
3842          \dim_sub:Nn \l__enumext_item_width_viii_dim
3843            {
3844              ( \l__enumext_rightmargin_viii_dim * \l__enumext_tmpa_vii_int )
3845              / \l__enumext_columns_viii_int
3846            }
3847          \dim_add:Nn \l__enumext_columns_sep_viii_dim
3848            {
3849              \l__enumext_rightmargin_viii_dim
3850            }
3851        }
3852    }
```

(*End of definition for* `\__enumext_starred_columns_set_vii:` *and* `\__enumext_starred_columns_set_viii:`.)

11.42.2 Functions for join item columns

<div style="float:left">

`\__enumext_starred_joined_item_vii:n`
`\__enumext_starred_joined_item_viii:n`

</div>

The functions `\__enumext_starred_joined_item_vii:n` and `\__enumext_starred_joined_item_-viii:n` will set the *width* of the box in which the content passed to `\item`(⟨*columns*⟩) will be stored together with the value of `\itemwidth` for the `enumext*` environment.

```
3853  \cs_new_protected:Npn \__enumext_starred_joined_item_vii:n #1
3854    {
3855      \int_set:Nn \l__enumext_joined_item_vii_int {#1}
3856      \int_compare:nNnT { \l__enumext_joined_item_vii_int } > { \l__enumext_columns_vii_int }
3857        {
3858          \msg_warning:nnee { enumext } { item-joined }
3859            { \int_use:N \l__enumext_joined_item_vii_int }
3860            { \int_use:N \l__enumext_columns_vii_int }
3861          \int_set:Nn \l__enumext_joined_item_vii_int
3862            {
3863              \l__enumext_columns_vii_int - \l__enumext_item_column_pos_vii_int + 1
3864            }
3865        }
3866      \int_compare:nNnT
3867        { \l__enumext_joined_item_vii_int }
3868        >
3869        { \l__enumext_columns_vii_int - \l__enumext_item_column_pos_vii_int + 1 }
3870        {
3871          \msg_warning:nnee { enumext } { item-joined-columns }
3872            { \int_use:N \l__enumext_joined_item_vii_int }
3873            {
3874              \int_eval:n
3875                { \l__enumext_columns_vii_int - \l__enumext_item_column_pos_vii_int + 1 }
3876            }
3877          \int_set:Nn \l__enumext_joined_item_vii_int
3878            {
3879              \l__enumext_columns_vii_int - \l__enumext_item_column_pos_vii_int + 1
3880            }
3881        }
3882      \int_compare:nNnTF { \l__enumext_joined_item_vii_int } > { 1 }
3883        {
3884          \int_set_eq:NN \l__enumext_joined_item_aux_vii_int \l__enumext_joined_item_vii_int
```

```
3885        \int_decr:N \l__enumext_joined_item_aux_vii_int
3886        \int_add:Nn \l__enumext_item_column_pos_vii_int { \l__enumext_joined_item_aux_vii_int }
3887        \int_gadd:Nn \g__enumext_item_count_all_vii_int { \l__enumext_joined_item_aux_vii_int }
3888        \dim_set:Nn \l__enumext_joined_width_vii_dim
3889          {
3890            \l__enumext_item_width_vii_dim * \l__enumext_joined_item_vii_int
3891          + (   \l__enumext_labelwidth_vii_dim + \l__enumext_labelsep_vii_dim
3892            + \l__enumext_columns_sep_vii_dim
3893          )*\l__enumext_joined_item_aux_vii_int
3894          }
3895        \dim_set_eq:NN \itemwidth \l__enumext_joined_width_vii_dim
3896      }
3897      {
3898        \dim_set_eq:NN \l__enumext_joined_width_vii_dim \l__enumext_item_width_vii_dim
3899        \dim_set_eq:NN \itemwidth \l__enumext_item_width_vii_dim
3900      }
3901    }
```

Same implementation for the keyans* environment.

```
3902  \cs_new_protected:Npn \__enumext_starred_joined_item_viii:n #1
3903    {
3904      \int_set:Nn \l__enumext_joined_item_viii_int {#1}
3905      \int_compare:nNnT { \l__enumext_joined_item_viii_int } > { \l__enumext_columns_viii_int }
3906        {
3907          \msg_warning:nnee { enumext } { item-joined }
3908            { \int_use:N \l__enumext_joined_item_viii_int }
3909            { \int_use:N \l__enumext_columns_viii_int }
3910          \int_set:Nn \l__enumext_joined_item_viii_int
3911            {
3912              \l__enumext_columns_viii_int - \l__enumext_item_column_pos_viii_int + 1
3913            }
3914        }
3915      \int_compare:nNnT
3916        { \l__enumext_joined_item_viii_int }
3917        >
3918        { \l__enumext_columns_viii_int - \l__enumext_item_column_pos_viii_int + 1 }
3919        {
3920          \msg_warning:nnee { enumext } { item-joined-columns }
3921            { \int_use:N \l__enumext_joined_item_viii_int }
3922            {
3923              \int_eval:n
3924                { \l__enumext_columns_viii_int - \l__enumext_item_column_pos_viii_int + 1 }
3925            }
3926          \int_set:Nn \l__enumext_joined_item_viii_int
3927            {
3928              \l__enumext_columns_viii_int - \l__enumext_item_column_pos_viii_int + 1
3929            }
3930        }
3931      \int_compare:nNnTF { \l__enumext_joined_item_viii_int } > { 1 }
3932        {
3933          \int_set_eq:NN \l__enumext_joined_item_aux_viii_int \l__enumext_joined_item_viii_int
3934          \int_decr:N \l__enumext_joined_item_aux_viii_int
3935          \int_add:Nn \l__enumext_item_column_pos_viii_int { \l__enumext_joined_item_aux_viii_int }
3936          \int_gadd:Nn \g__enumext_item_count_all_viii_int { \l__enumext_joined_item_aux_viii_int }
3937          \dim_set:Nn \l__enumext_joined_width_viii_dim
3938            {
3939              \l__enumext_item_width_viii_dim * \l__enumext_joined_item_viii_int
3940            + ( \l__enumext_labelwidth_viii_dim + \l__enumext_labelsep_viii_dim
3941              + \l__enumext_columns_sep_viii_dim
3942            )*\l__enumext_joined_item_aux_viii_int
3943            }
3944          \dim_set_eq:NN \itemwidth \l__enumext_joined_width_viii_dim
3945        }
3946        {
3947          \dim_set_eq:NN \l__enumext_joined_width_viii_dim \l__enumext_item_width_viii_dim
3948          \dim_set_eq:NN \itemwidth \l__enumext_item_width_viii_dim
3949        }
3950    }
```

(*End of definition for* __enumext_starred_joined_item_vii:n *and* __enumext_starred_joined_item_viii:n.)

11.42.3 Functions for `mini-env`, `mini-right` and `mini-right*` keys

`\__enumext_start_mini_vii:`
`\__enumext_stop_mini_vii:`

The implementation of the `mini-env` key support is almost identical to the one used in the `enumext` and `keyans` environments, the difference is that the `__enumext_mini_env*` environment on the *"right side"* is executed *"after"* closing the environment, so it is necessary to make a global copy of the variable `\l__enumext_minipage_right_vii_dim` in the variable `\g__enumext_minipage_right_vii_dim`.

```
3951  \cs_new_protected:Nn \__enumext_start_mini_vii:
3952    {
3953      \dim_compare:nNnT { \l__enumext_minipage_right_vii_dim } > { \c_zero_dim }
3954        {
3955          \dim_set:Nn \l__enumext_minipage_left_vii_dim
3956            {
3957              \linewidth
3958              - \l__enumext_minipage_right_vii_dim
3959              - \l__enumext_minipage_hsep_vii_dim
3960            }
3961          \bool_set_true:N \l__enumext_minipage_active_vii_bool
3962          \dim_gset_eq:NN
3963            \g__enumext_minipage_right_vii_dim
3964            \l__enumext_minipage_right_vii_dim
3965          \__enumext_mini_addvspace_vii:
3966          \nointerlineskip\noindent
3967          \begin{__enumext_mini_env*}{ \l__enumext_minipage_left_vii_dim }
3968        }
3969    }
```

The function `\__enumext_stop_mini_vii:` closes the `__enumext_mini_env*` environment on the left side, applies `\hfill` and sets the value of the variable `\g__enumext_minipage_active_vii_bool` to true which will be used in the function `\__enumext_after_env:nn` to execute the `__enumext_mini_-env*` on the *"right side"*.

```
3970  \cs_new_protected:Nn \__enumext_stop_mini_vii:
3971    {
3972      \bool_if:NT \l__enumext_minipage_active_vii_bool
3973        {
3974          \end{__enumext_mini_env*}
3975          \hfill
3976          \bool_gset_true:N \g__enumext_minipage_active_vii_bool
3977        }
3978    }
```

Finally we execute the {⟨*code*⟩} passed to the `mini-right` or `mini-right*` keys stored in the variable `\g__enumext_miniright_code_vii_tl` in the `__enumext_mini_env*` environment on the *"right side"*. For compatibility with the `caption` package and possibly other {⟨*code*⟩} passed to this key, we will pass it to a box and then print it.

```
3979  \__enumext_after_env:nn {enumext*}
3980    {
3981      \bool_if:NT \g__enumext_minipage_active_vii_bool
3982        {
3983          \begin{__enumext_mini_env*}{ \g__enumext_minipage_right_vii_dim }
3984            \par\addvspace { \g__enumext_minipage_right_skip }
3985            \bool_if:NF \g__enumext_minipage_center_vii_bool
3986              {
3987                \tl_put_left:Nn \g__enumext_miniright_code_vii_tl
3988                  {
3989                    \centering
3990                  }
3991              }
3992            \vbox_set_top:Nn \l__enumext_miniright_code_vii_box
3993              {
3994                \tl_use:N \g__enumext_miniright_code_vii_tl
3995              }
3996            \box_use_drop:N \l__enumext_miniright_code_vii_box
3997          \end{__enumext_mini_env*}
3998          \par\addvspace{ \g__enumext_minipage_after_skip }
3999        }
4000      \bool_gset_false:N \g__enumext_minipage_active_vii_bool
4001      \bool_gset_true:N \g__enumext_minipage_center_vii_bool
4002      \tl_gclear:N \g__enumext_miniright_code_vii_tl
4003      \dim_gzero:N \g__enumext_minipage_right_vii_dim
4004      \bool_gset_false:N \g__enumext_starred_bool
4005    }
```

(End of definition for `\__enumext_start_mini_vii:` *and* `\__enumext_stop_mini_vii:`.*)*

`\__enumext_start_mini_viii:`
`\__enumext_stop_mini_viii:`

The implementation of the `mini-env`, `mini-right` and `mini-right*` keys is identical to the one used in the `enumext*` environment.

```
4006  \cs_new_protected:Nn \__enumext_start_mini_viii:
4007    {
4008      \dim_compare:nNnT { \l__enumext_minipage_right_viii_dim } > { \c_zero_dim }
4009        {
4010          \dim_set:Nn \l__enumext_minipage_left_viii_dim
4011            {
4012              \linewidth
4013              - \l__enumext_minipage_right_viii_dim
4014              - \l__enumext_minipage_hsep_viii_dim
4015            }
4016          \bool_set_true:N \l__enumext_minipage_active_viii_bool
4017          \dim_gset_eq:NN
4018            \g__enumext_minipage_right_viii_dim
4019            \l__enumext_minipage_right_viii_dim
4020          \__enumext_mini_addvspace_viii:
4021          \nointerlineskip\noindent
4022          \begin{__enumext_mini_env*}{ \l__enumext_minipage_left_viii_dim }
4023        }
4024    }
4025  \cs_new_protected:Nn \__enumext_stop_mini_viii:
4026    {
4027      \bool_if:NT \l__enumext_minipage_active_viii_bool
4028        {
4029          \end{__enumext_mini_env*}
4030          \hfill
4031          \bool_gset_true:N \g__enumext_minipage_active_viii_bool
4032        }
4033    }
4034  \__enumext_after_env:nn {keyans*}
4035    {
4036      \bool_if:NT \g__enumext_minipage_active_viii_bool
4037        {
4038          \begin{__enumext_mini_env*}{ \g__enumext_minipage_right_viii_dim }
4039            \par\addvspace { \g__enumext_minipage_right_skip }
4040            \bool_if:NF \g__enumext_minipage_center_viii_bool
4041              {
4042                \tl_put_left:Nn \g__enumext_miniright_code_viii_tl
4043                  {
4044                    \centering
4045                  }
4046              }
4047            \vbox_set_top:Nn \l__enumext_miniright_code_viii_box
4048              {
4049                \tl_use:N \g__enumext_miniright_code_viii_tl
4050              }
4051            \box_use_drop:N \l__enumext_miniright_code_viii_box
4052          \end{__enumext_mini_env*}
4053          \par\addvspace{ \g__enumext_minipage_after_skip }
4054        }
4055      \bool_gset_false:N \g__enumext_minipage_active_viii_bool
4056      \bool_gset_true:N \g__enumext_minipage_center_viii_bool
4057      \tl_gclear:N \g__enumext_miniright_code_viii_tl
4058      \dim_gzero:N \g__enumext_minipage_right_viii_dim
4059    }
```

(End of definition for `\__enumext_start_mini_viii:` *and* `\__enumext_stop_mini_viii:`.*)*

11.43 The environment enumext*

enumext*

First we will generate the environment and we will give a temporary definition to `\__enumext_stop_-item_tmp_vii:` equal to `\noindent` and next to `\item` equal to `\__enumext_start_item_tmp_vii:` which we will redefine later.

```
4060  \NewDocumentEnvironment{enumext*}{ o }
4061    {
4062      \__enumext_safe_exec_vii:
4063      \__enumext_parse_keys_vii:n {#1}
4064      \__enumext_before_list_vii:
```

```
4065    \__enumext_start_store_level_vii:
4066    \__enumext_start_list:nn { }
4067      {
4068        \__enumext_list_arg_two_vii:
4069        \__enumext_before_keys_exec_vii:
4070      }
4071    \__enumext_starred_columns_set_vii:
4072    \item[] \scan_stop:
4073    \cs_set_eq:NN \__enumext_stop_item_tmp_vii: \noindent
4074    \cs_set_eq:NN \item \__enumext_start_item_tmp_vii:
4075  }
4076  {
4077    \__enumext_stop_item_tmp_vii:
4078    \__enumext_remove_extra_parsep_vii:
4079    \__enumext_stop_list:
4080    \__enumext_stop_store_level_vii:
4081    \__enumext_after_list_vii:
4082  }
```

(*End of definition for* enumext*. *This function is documented on page* 4.)

__enumext_safe_exec_vii: We will first call the function __enumext_internal_mini_page: to create the environment __-enumext_mini_env*, then the function __enumext_is_not_nested: which sets \g__enumext_-starred_bool to true if we are not nested within enumext, we will increment \l__enumext_level_-h_int to restrict nesting of the environment, set \l__enumext_starred_bool to true and finally call the function __enumext_is_on_first_level: which sets \l__enumext_starred_first_bool to true if we are not nested, allowing the *"storage system"* to be used.

```
4083  \cs_new_protected:Nn \__enumext_safe_exec_vii:
4084    {
4085      \__enumext_internal_mini_page:
4086      \__enumext_is_not_nested:
4087      \int_incr:N \l__enumext_level_h_int
4088      \int_compare:nNnT { \l__enumext_level_h_int } > { 1 }
4089        {
4090          \msg_error:nn { enumext } { nested }
4091        }
4092      \int_compare:nNnT { \l__enumext_keyans_level_h_int } = { 1 }
4093        {
4094          \msg_error:nnn { enumext } { nested-horizontal } { keyans*}
4095        }
4096      \bool_set_true:N \l__enumext_starred_bool
4097      \bool_set_false:N \l__enumext_standar_bool
4098      \__enumext_is_on_first_level:
4099    }
```

(*End of definition for* __enumext_safe_exec_vii:.)

__enumext_parse_keys_vii:n   First we will clear the variable \l__enumext_series_str used by the key series, process the environment [⟨*key = val*⟩] and execute the function __enumext_parse_series:n and used by the key series, then we execute the function __enumext_store_active_keys_vii:n and reprocess the ⟨*keys*⟩ to pass them to the storage ⟨*sequence*⟩ if the key save-key is not active and finally we call the function __enumext_nested_base_line_fix: used by the key base-fix.

```
4100  \cs_new_protected:Npn \__enumext_parse_keys_vii:n #1
4101    {
4102      \tl_if_novalue:nF {#1}
4103        {
4104          \str_clear:N \l__enumext_series_str
4105          \keys_set:nn { enumext / enumext* } {#1}
4106          \__enumext_parse_series:n {#1}
4107          \__enumext_store_active_keys_vii:n {#1}
4108          \__enumext_nested_base_line_fix:
4109        }
4110    }
```

(*End of definition for* __enumext_parse_keys_vii:n.)

__enumext_before_list_vii: The function __enumext_before_list_vii: first calls the function __enumext_vspace_above_-vii: used by the keys above and above*, then calls the function __enumext_check_ans_active: for the check answer mechanism and finally calls the functions __enumext_before_args_exec: and __enumext_start_mini_vii: used by the keys before*, mini-env, mini-right and mini-right*.

```
4111  \cs_new_protected:Nn \__enumext_before_list_vii:
4112    {
4113      \__enumext_vspace_above_vii:
4114      \__enumext_check_ans_active:
4115      \__enumext_before_args_exec_vii:
4116      \__enumext_start_mini_vii:
4117    }
```

(*End of definition for* __enumext_before_list_vii:.)

__enumext_after_list_vii: The function __enumext_after_list_vii: first calls the function __enumext_stop_mini_vii: used by the keys mini-env, mini-right and mini-right*, then to the functions __enumext_-after_stop_list_vii: used by the key after, __enumext_check_ans_key_hook: used by the key check-ans, __enumext_vspace_below_vii: used by the keys below and below*. Finally set \l__enumext_starred_bool to false and call the __enumext_resume_save_counter: function used by the series, resume and resume* keys.

```
4118  \cs_new_protected:Nn \__enumext_after_list_vii:
4119    {
4120      \__enumext_stop_mini_vii:
4121      \__enumext_after_stop_list_vii:
4122      \__enumext_check_ans_key_hook:
4123      \__enumext_vspace_below_vii:
4124      \bool_set_false:N \l__enumext_starred_bool
4125      \__enumext_resume_save_counter:
4126    }
```

(*End of definition for* __enumext_after_list_vii:.)

__enumext_start_store_level_vii: The __enumext_start_store_level_vii: and __enumext_stop_store_level_vii: functions
__enumext_stop_store_level_vii: activate the level saving mechanism for storage in ⟨*sequence*⟩ of the \anskey command and anskey* environment if enumext* are nested in enumext.

```
4127  \cs_new_protected:Nn \__enumext_start_store_level_vii:
4128    {
4129      \bool_if:NT \l__enumext_store_active_bool
4130        {
4131          \int_compare:nNnT { \l__enumext_level_int } > { 0 }
4132            {
4133              \__enumext_store_level_open_vii:
4134            }
4135        }
4136    }
4137  \cs_new_protected:Nn \__enumext_stop_store_level_vii:
4138    {
4139      \bool_if:NT \l__enumext_store_active_bool
4140        {
4141          \int_compare:nNnT { \l__enumext_level_int } > { 0 }
4142            {
4143              \__enumext_store_level_close_vii:
4144            }
4145        }
4146    }
```

(*End of definition for* __enumext_start_store_level_vii: *and* __enumext_stop_store_level_vii:.)

11.43.1   The command \item in enumext*

__enumext_start_item_tmp_vii: First we will call the function __enumext_stop_item_tmp_vii: that we will redefine later, we will increment the value of \l__enumext_item_column_pos_vii_int that will count the item's by rows and the value of \g__enumext_item_count_all_vii_int that will count the total of item's in the environment. After that we will call the function __enumext_item_peek_args_vii: that will handle the arguments passed to \item.

```
4147  \cs_new_protected_nopar:Nn \__enumext_start_item_tmp_vii:
4148    {
4149      \__enumext_stop_item_tmp_vii:
4150      \int_incr:N \l__enumext_item_column_pos_vii_int
4151      \int_gincr:N \g__enumext_item_count_all_vii_int
4152      \__enumext_item_peek_args_vii:
4153    }
```

(*End of definition for* __enumext_start_item_tmp_vii:.)

__enumext_item_peek_args_vii:

The function __enumext_item_peek_args_vii: will handle the \item(⟨number⟩). Look for the argument "(", if it is present we will call the function __enumext_joined_item_vii:w (⟨number⟩), which is in charge of joining the item's in the same row, in case they are not present we will set the default value (1).

```
4154 \cs_new_protected:Nn \__enumext_item_peek_args_vii:
4155   {
4156     \peek_meaning:NTF (
4157       { \__enumext_joined_item_vii:w }
4158       { \__enumext_joined_item_vii:w (1) }
4159   }
```

(*End of definition for* __enumext_item_peek_args_vii:.)

__enumext_joined_item_vii:w

The function __enumext_joined_item_vii:w will first call the function __enumext_starred_-joined_item_vii:n in charge of setting the *width* of the box that will store the content passed to \item. Then we will look for the argument "*", if it is present we will call the function __enumext_starred_-item_vii:w otherwise we will call the function __enumext_standar_item_vii:w.

```
4160 \cs_new_protected:Npn \__enumext_joined_item_vii:w (#1)
4161   {
4162     \__enumext_starred_joined_item_vii:n {#1}
4163     \peek_meaning_remove:NTF *
4164       { \__enumext_starred_item_vii:w  }
4165       { \__enumext_standar_item_vii:w }
4166   }
```

(*End of definition for* __enumext_joined_item_vii:w.)

__enumext_standar_item_vii:w

The function __enumext_standar_item_vii:w will first look for the argument "[", if present it will set the state of the variable \l__enumext_wrap_label_opt_vii_bool equal to the state of the variable \l__enumext_wrap_label_opt_vii_bool handled by the key wrap-label* and finally execute the *non-enumerated* version \item[⟨custom⟩] by means of the function __enumext_start_item_vii:w, otherwise we will set the value of the variable \l__enumext_wrap_label_vii_bool handled by the wrap-label key to true and set the switch \if@noitemarg to true to execute the enumerated version of \item by means of the function __enumext_start_item_vii:w [\l__enumext_label_vii_tl].

```
4167 \cs_new_protected:Npn \__enumext_standar_item_vii:w
4168   {
4169     \bool_set_false:N \l__enumext_item_starred_vii_bool
4170       \peek_meaning:NTF [
4171         {
4172           \bool_set_eq:NN
4173             \l__enumext_wrap_label_vii_bool
4174             \l__enumext_wrap_label_opt_vii_bool
4175           \__enumext_start_item_vii:w
4176         }
4177         {
4178           \bool_set_true:N \l__enumext_wrap_label_vii_bool
4179           \legacy_if_set_true:n { @noitemarg }
4180           \__enumext_start_item_vii:w [ \l__enumext_label_vii_tl ]
4181         }
4182   }
```

(*End of definition for* __enumext_standar_item_vii:w.)

__enumext_starred_item_vii:w
__enumext_starred_item_vii_aux_i:w
__enumext_starred_item_vii_aux_ii:w
__enumext_starred_item_vii_aux_iii:w

The function __enumext_starred_item_vii:w together with the specified auxiliary functions aux_i:w, aux_ii:w, and aux_iii:w execute \item*, \item*[⟨symbol⟩] and \item*[⟨symbol⟩][⟨offset⟩].

```
4183 \cs_new_protected:Npn \__enumext_starred_item_vii:w
4184   {
4185     \bool_set_true:N \l__enumext_item_starred_vii_bool
4186     \bool_set_true:N \l__enumext_wrap_label_vii_bool
4187     \peek_meaning:NTF [
4188       { \__enumext_starred_item_vii_aux_i:w }
4189       { \__enumext_starred_item_vii_aux_ii:w }
4190   }
4191 \cs_new_protected:Npn \__enumext_starred_item_vii_aux_i:w [#1]
4192   {
4193     \tl_gset:Nn \g__enumext_item_symbol_aux_vii_tl {#1}
4194     \__enumext_starred_item_vii_aux_ii:w
4195   }
4196 \cs_new_protected:Npn \__enumext_starred_item_vii_aux_ii:w
```

```
4197     {
4198       \peek_meaning:NTF [
4199         { \__enumext_starred_item_vii_aux_iii:w }
4200         {
4201           \dim_set_eq:NN
4202             \l__enumext_item_symbol_sep_vii_dim
4203             \l__enumext_labelsep_vii_dim
4204           \legacy_if_set_true:n { @noitemarg }
4205           \__enumext_start_item_vii:w [ \l__enumext_label_vii_tl ]
4206         }
4207     }
4208 \cs_new_protected:Npn \__enumext_starred_item_vii_aux_iii:w [#1]
4209   {
4210     \dim_set:Nn \l__enumext_item_symbol_sep_vii_dim {#1}
4211     \legacy_if_set_true:n { @noitemarg }
4212     \__enumext_start_item_vii:w [ \l__enumext_label_vii_tl ]
4213   }
```

(*End of definition for* __enumext_starred_item_vii:w *and others.*)

11.43.2 Real definition of \item in enumext*

__enumext_start_item_vii:w

The functions __enumext_start_item_vii:w and __enumext_stop_item_vii: executing the true definition of \item inside the enumext* environment. The first thing we will do is set the value of __enumext_stop_item_tmp_vii: equal to __enumext_stop_item_vii: which we will define later and add the hyperref compatible enumXvii counter, after that we will start capturing the item content in a box. Here need setting the \if@hyper@item switch to *"true"* for hyperref compatible. The explanation for this is given by the master Heiko Oberdiek on \refstepcounter{enumi} twice (or more) creates destination with the same identifier.

```
4214 \cs_new_protected_nopar:Npn \__enumext_start_item_vii:w [#1]
4215   {
4216     \cs_set_eq:NN \__enumext_stop_item_tmp_vii: \__enumext_stop_item_vii:
4217     \legacy_if:nT { @noitemarg }
4218       {
4219         \legacy_if_set_false:n { @noitemarg }
4220         \legacy_if:nT { @nmbrlist }
4221           {
4222             \bool_if:NT \l__enumext_hyperref_bool
4223               {
4224                 \legacy_if_set_true:n { @hyper@item }
4225               }
4226             \refstepcounter{enumXvii}
4227             \bool_if:NT \l__enumext_check_answers_bool
4228               {
4229                 \int_gincr:N \g__enumext_item_number_int
4230                 \bool_set_true:N \l__enumext_item_number_bool
4231               }
4232           }
4233       }
```

Here we start capturing \item and its contents into a group using the plain form of the lrbox environment. If the state of the variable \l__enumext_footnotes_key_bool is false, we will redefine the command \footnote, followed by printing the *⟨symbol⟩* defined for \item* if it is present and open a new group inside which we execute font key next to \item and the keys wrap-label, wrap-label*, align, close the group and execute the key labelsep and then the key first. Finally we open the minipage environment and execute the listparindent key which will be equal to \parindent, the parsep key which will be equal to \parskip and the itemindent key.

```
4234       \group_begin:
4235         \lrbox{ \l__enumext_item_text_vii_box }
4236         \bool_if:NF \l__enumext_footnotes_key_bool
4237           {
4238             \__enumext_renew_footnote:
4239           }
4240         \bool_if:NT \l__enumext_item_starred_vii_bool
4241           {
4242             \tl_if_blank:VT \g__enumext_item_symbol_aux_vii_tl
4243               {
4244                 \tl_gset_eq:NN
4245                   \g__enumext_item_symbol_aux_vii_tl \l__enumext_item_symbol_vii_tl
4246               }
4247             \mode_leave_vertical:
```

```
4248              \skip_horizontal:n { -\l__enumext_item_symbol_sep_vii_dim }
4249              \makebox[ 0pt ][ r ]{ \g__enumext_item_symbol_aux_vii_tl }
4250              \skip_horizontal:N \l__enumext_item_symbol_sep_vii_dim
4251              \tl_gclear:N \g__enumext_item_symbol_aux_vii_tl
4252            }
4253          \group_begin:
4254            \tl_use:N \l__enumext_label_font_style_vii_tl
4255            \bool_if:NTF \l__enumext_wrap_label_vii_bool
4256              {
4257                \makebox[ \l__enumext_labelwidth_vii_dim ][ \l__enumext_align_label_vii_str ]
4258                  { \__enumext_wrapper_label_vii:n {#1} }
4259              }
4260              {
4261                \makebox[ \l__enumext_labelwidth_vii_dim ][ \l__enumext_align_label_vii_str ]{ #1 }
4262              }
4263          \group_end:
4264          \skip_horizontal:N \l__enumext_labelsep_vii_dim
4265          \tl_use:N \l__enumext_after_list_args_vii_tl
4266          \__enumext_minipage:w [ t ]{ \l__enumext_joined_width_vii_dim  }
4267            \skip_set_eq:NN \parindent \l__enumext_listparindent_vii_dim
4268            \skip_set_eq:NN \parskip \l__enumext_parsep_vii_skip
4269            \tl_use:N \l__enumext_fake_item_indent_vii_tl
4270        }
```

(*End of definition for* `\__enumext_start_item_vii:w`.)

`\__enumext_stop_item_vii:`   The function `\__enumext_stop_item_vii:` shall terminate with the capture of `\item` and its ⟨*contents*⟩. Close the environments `minipage`, `lrbox` and the group. Then we only have to set the width of the box and print it next to `\footnote`, and add the horizontal and vertical separation between the boxes.

```
4271 \cs_new_protected_nopar:Nn \__enumext_stop_item_vii:
4272   {
4273        \__enumext_endminipage:
4274      \endlrbox
4275    \group_end:
4276    \box_set_wd:Nn \l__enumext_item_text_vii_box
4277      {
4278        \l__enumext_joined_width_vii_dim
4279        + \l__enumext_labelwidth_vii_dim
4280        + \l__enumext_labelsep_vii_dim
4281      }
4282    \int_set:Nn \hbadness { 10000 }
4283    \box_use_drop:N \l__enumext_item_text_vii_box
4284    \bool_if:NF \l__enumext_footnotes_key_bool
4285      {
4286        \__enumext_print_footnote:
4287      }
4288    \int_compare:nNnTF { \l__enumext_item_column_pos_vii_int } = { \l__enumext_columns_vii_int }
4289      {
4290        \par\noindent
4291        \int_zero:N \l__enumext_item_column_pos_vii_int
4292      }
4293      { \hspace{ \l__enumext_columns_sep_vii_dim } }
4294   }
```

(*End of definition for* `\__enumext_stop_item_vii:`.)

`\__enumext_remove_extra_parsep_vii:`   Finally we will remove the vertical space equal to `\parsep` when the total number of items is divisible by the number of items in the last row of the environment.

```
4295 \cs_new_protected:Nn \__enumext_remove_extra_parsep_vii:
4296   {
4297    \int_compare:nNnT
4298      {
4299        \int_mod:nn {  \g__enumext_item_count_all_vii_int } { \l__enumext_columns_vii_int }
4300      }
4301      =
4302      { 0 }
4303      {
4304        \par
4305        \vspace{ -\l__enumext_itemsep_vii_skip }
4306        \int_gzero:N \g__enumext_item_count_all_vii_int
4307      }
4308   }
```

As we don't want our check to be executed `check-ans` by levels but on the complete list, we will take it out of the `enumext*` environment using the *"hook"* function `\__enumext_after_env:nn`.

```
4309 \__enumext_after_env:nn {enumext*} { \__enumext_execute_after_env: }
```

(*End of definition for* `\__enumext_remove_extra_parsep_vii:`.)

11.44 The environment keyans*

keyans*   First we will generate the environment and we will give a temporary definition to `\__enumext_stop_-item_tmp_viii:` equal to `\noindent` and next to `\item` equal to `\__enumext_start_item_tmp_-viii:` which we will redefine later.

```
4310 \NewDocumentEnvironment{keyans*}{ o }
4311   {
4312     \__enumext_safe_exec_viii:
4313     \__enumext_parse_keys_viii:n {#1}
4314     \__enumext_before_list_viii:
4315     \__enumext_start_list:nn { }
4316       {
4317         \__enumext_list_arg_two_viii:
4318         \__enumext_before_keys_exec_viii:
4319       }
4320     \__enumext_starred_columns_set_viii:
4321     \item[] \scan_stop:
4322     \cs_set_eq:NN \__enumext_stop_item_tmp_viii: \noindent
4323     \cs_set_eq:NN \item \__enumext_start_item_tmp_viii:
4324   }
4325   {
4326     \__enumext_stop_item_tmp_viii:
4327     \__enumext_remove_extra_parsep_viii:
4328     \__enumext_check_starred_cmd:n { item }
4329     \__enumext_stop_list:
4330     \__enumext_after_list_viii:
4331   }
```

(*End of definition for* keyans*. *This function is documented on page* 14.)

`\__enumext_safe_exec_viii:`   First check the maximum nesting level for the `keyans*` environment.

```
4332 \cs_new_protected:Nn \__enumext_safe_exec_viii:
4333   {
4334     \int_incr:N \l__enumext_keyans_level_h_int
4335     \int_compare:nNnT { \l__enumext_keyans_level_h_int } > { 1 }
4336       {
4337         \msg_error:nn { enumext } { nested }
4338       }
4339     \__enumext_keyans_name_and_start:
4340     \bool_if:NT \l__enumext_starred_bool
4341       {
4342         \msg_error:nnn { enumext } { nested-horizontal } { enumext* }
4343       }
4344     \bool_set_true:N \l__enumext_starred_bool
4345     % Set false for interfering with enumext nested in keyans* (yes, its possible and crayze)
4346     \bool_set_false:N \l__enumext_store_active_bool
4347     \int_compare:nNnT { \l__enumext_level_int } > { 1 }
4348       {
4349         \msg_error:nn { enumext } { keyans-wrong-level }
4350       }
4351   }
```

(*End of definition for* `\__enumext_safe_exec_viii:`.)

`\__enumext_parse_keys_viii:n`   Parse [⟨*key = val*⟩] for `keyans*`.

```
4352 \cs_new_protected:Npn \__enumext_parse_keys_viii:n #1
4353   {
4354     \tl_if_novalue:nF {#1}
4355       {
4356         \keys_set:nn { enumext / keyans* } {#1}
4357       }
4358   }
```

(*End of definition for* `\__enumext_parse_keys_viii:n`.)

`\__enumext_before_list_viii:`

The function `\__enumext_before_list_viii:` will add the vertical spacing on the environment if the `above` key is active next to the {⟨*code*⟩} defined by the `before*` key if it is active, the call the function `\__enumext_start_mini_viii:` handle by `mini-env`.

```
4359  \cs_new_protected:Nn \__enumext_before_list_viii:
4360    {
4361      \__enumext_vspace_above_viii:
4362      \__enumext_before_args_exec_viii:
4363      \__enumext_start_mini_viii:
4364    }
```

(*End of definition for* `\__enumext_before_list_viii:`.)

`\__enumext_after_list_viii:`

The function `\__enumext_after_list:` first call the function `\__enumext_stop_mini_viii:`, then apply the {⟨*code*⟩} handled by the `after` key together with the *vertical space* handled by the `below` key if they are present.

```
4365  \cs_new_protected:Nn \__enumext_after_list_viii:
4366    {
4367      \__enumext_stop_mini_viii:
4368      \__enumext_after_stop_list_viii:
4369      \__enumext_vspace_below_viii:
4370    }
```

(*End of definition for* `\__enumext_after_list_viii:`.)

11.44.1 The command \item in keyans*

The idea here is to make the `\item` command behave in the same way as in the `keyans` environment with the difference of the optional argument (⟨*number*⟩) which works in the same way as in the `enumext*` environment. In simple terms we want to store the ⟨*label*⟩ next to the [⟨*content*⟩] if it is present in the ⟨*sequence*⟩ and ⟨*prop list*⟩ defined by `save-ans` key for `\item*`, `\item*[⟨content⟩]`, `\item(⟨number⟩)*` and `\item(⟨number⟩)*[⟨content⟩]` commands.

`\__enumext_start_item_tmp_viii:`

First we will call the function `\__enumext_stop_item_tmp_viii:` that we will redefine later, we will increment the value of `\l__enumext_item_column_pos_viii_int` that will count the item's by rows and the value of `\g__enumext_item_count_all_viii_int` that will count the total of item's in the environment. After that we will call the function `\__enumext_item_peek_args_viii:` that will handle the arguments passed to `\item`.

```
4371  \cs_new_protected_nopar:Nn \__enumext_start_item_tmp_viii:
4372    {
4373      \__enumext_stop_item_tmp_viii:
4374      \int_incr:N \l__enumext_item_column_pos_viii_int
4375      \int_gincr:N \g__enumext_item_count_all_viii_int
4376      \__enumext_item_peek_args_viii:
4377    }
```

(*End of definition for* `\__enumext_start_item_tmp_viii:`.)

`\__enumext_item_peek_args_viii:`

The function `\__enumext_item_peek_args_viii:` will handle the `\item(⟨number⟩)`. Look for the argument "(", if it is present we will call the function `\__enumext_joined_item_viii:w (⟨number⟩)`, which is in charge of joining the item's in the same row, in case they are not present we will set the default value `(1)`.

```
4378  \cs_new_protected:Nn \__enumext_item_peek_args_viii:
4379    {
4380      \peek_meaning:NTF (
4381        { \__enumext_joined_item_viii:w }
4382        { \__enumext_joined_item_viii:w (1) }
4383    }
```

(*End of definition for* `\__enumext_item_peek_args_viii:`.)

`\__enumext_joined_item_viii:w`

The function `\__enumext_joined_item_viii:w` will first call the function `\__enumext_starred_-joined_item_viii:n` in charge of setting the *width* of the box that will store the content passed to `\item`. Then we will look for the argument "*", if it is present we will call the function `\__enumext_starred_-item_viii:w` otherwise we will call the function `\__enumext_standar_item_viii:w`.

```
4384  \cs_new_protected:Npn \__enumext_joined_item_viii:w (#1)
4385    {
4386      \__enumext_starred_joined_item_viii:n {#1}
4387      \peek_meaning_remove:NTF *
4388        { \__enumext_starred_item_viii:w  }
4389        { \__enumext_standar_item_viii:w }
4390    }
```

(*End of definition for* __enumext_joined_item_viii:w.)

__enumext_standar_item_viii:w   The function __enumext_standar_item_viii:w will first look for the argument "[", if present it will set the state of the variable \l__enumext_wrap_label_opt_viii_bool equal to the state of the variable \l__enumext_wrap_label_opt_viii_bool handled by the key wrap-label* and finally execute the *non-enumerated* version \item[⟨*custom*⟩] by means of the function __enumext_start_item_viii:w, otherwise we will set the value of the variable \l__enumext_wrap_label_viii_bool handled by the wrap-label key to true and set the switch \if@noitemarg to true to execute the enumerated version of \item by means of the function __enumext_start_item_viii:w [\l__enumext_label_viii_tl].

```
4391  \cs_new_protected:Npn \__enumext_standar_item_viii:w
4392    {
4393      \bool_set_false:N \l__enumext_item_starred_viii_bool
4394        \peek_meaning:NTF [
4395          {
4396            \bool_set_eq:NN
4397              \l__enumext_wrap_label_viii_bool
4398              \l__enumext_wrap_label_opt_viii_bool
4399            \__enumext_start_item_viii:w
4400          }
4401          {
4402            \bool_set_true:N \l__enumext_wrap_label_viii_bool
4403            \legacy_if_set_true:n { @noitemarg }
4404            \__enumext_start_item_viii:w [ \l__enumext_label_viii_tl ]
4405          }
4406    }
```

(*End of definition for* __enumext_standar_item_viii:w.)

__enumext_starred_item_viii:w   The function __enumext_starred_item_viii:w together with the specified auxiliary functions
__enumext_starred_item_viii_aux_i:w   aux_i:w and aux_ii:w execute \item* and \item*[⟨*content*⟩].
__enumext_starred_item_viii_aux_ii:w

```
4407  \cs_new_protected:Npn \__enumext_starred_item_viii:w
4408    {
4409      \bool_set_true:N \l__enumext_item_starred_viii_bool
4410      \bool_set_true:N \l__enumext_wrap_label_viii_bool
4411      \peek_meaning:NTF [
4412        { \__enumext_starred_item_viii_aux_i:w }
4413        { \__enumext_starred_item_viii_aux_ii:w }
4414    }
```

The function __enumext_starred_item_viii_aux_i:w will save the optional argument to \item* in \l__enumext_store_current_opt_arg_tl and will save this argument along with the spacing set by the key save-sep in variable \l__enumext_store_current_label_tl if present, then call the function __enumext_starred_item_viii_aux_ii:w.

```
4415  \cs_new_protected:Npn \__enumext_starred_item_viii_aux_i:w [#1]
4416    {
4417      \tl_clear:N \l__enumext_store_current_label_tl
4418      \tl_if_novalue:nF { #1 }
4419        {
4420          \tl_if_empty:NF \l__enumext_store_keyans_item_opt_sep_tl
4421            {
4422              \tl_put_right:Ne \l__enumext_store_current_label_tl { \l__enumext_store_keyans_item_o|
4423              \tl_put_right:Ne \l__enumext_store_current_label_tl { #1 }
4424            }
4425          \tl_set:Ne \l__enumext_store_current_opt_arg_tl { #1 }
4426        }
4427      \__enumext_starred_item_viii_aux_ii:w
4428    }
4429  \cs_new_protected:Npn \__enumext_starred_item_viii_aux_ii:w
4430    {
4431      \legacy_if_set_true:n { @noitemarg }
4432      \__enumext_start_item_viii:w [ \l__enumext_label_viii_tl ]
4433    }
```

(*End of definition for* __enumext_starred_item_viii:w, __enumext_starred_item_viii_aux_i:w, *and* __enumext_-
starred_item_viii_aux_ii:w.)

__enumext_starred_item_exec: The function __enumext_starred_item_exec: will be in charge of storing the current ⟨*label*⟩ for \item* followed by the [⟨*content*⟩] for \item*[⟨*content*⟩] if present in the ⟨*sequence*⟩ and ⟨*prop list*⟩

set by the `save-ans` key. In this same function the keys `show-ans`, `show-pos` and `save-ref` are implemented.

```
4434  \cs_new_protected:Nn \__enumext_starred_item_exec:
4435    {
4436      \tl_put_left:Ne \l__enumext_store_current_label_tl { \l__enumext_label_viii_tl }
4437      \__enumext_store_addto_prop:V \l__enumext_store_current_label_tl
4438      \__enumext_keyans_store_ref:
4439      \tl_put_left:Ne \l__enumext_store_current_label_tl { \item }
4440      \__enumext_keyans_addto_seq_link:
4441      \int_gincr:N \g__enumext_check_starred_cmd_int
4442      \bool_if:NT \l__enumext_show_answer_bool
4443        {
4444          \__enumext_print_keyans_box:NN \l__enumext_labelwidth_i_dim \l__enumext_labelsep_i_dim
4445        }
4446      \bool_if:NT \l__enumext_show_position_bool
4447        {
4448          \tl_set:Ne \l__enumext_mark_answer_sym_tl
4449            {
4450              \group_begin:
4451                \exp_not:N \normalfont
4452                \exp_not:N \footnotesize [ \int_eval:n
4453                  {
4454                    \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop }
4455                  }
4456                ]
4457              \group_end:
4458            }
4459          \__enumext_print_keyans_box:NN \l__enumext_labelwidth_i_dim \l__enumext_labelsep_i_dim
4460        }
4461    }
```

(*End of definition for* `\__enumext_starred_item_exec:`.)

11.44.2   Real definition of `\item` in keyans*

`\__enumext_start_item_viii:w` The implementation at this point is very similar to that of the `enumext*` environment.

```
4462  \cs_new_protected_nopar:Npn \__enumext_start_item_viii:w [#1]
4463    {
4464      \cs_set_eq:NN \__enumext_stop_item_tmp_viii: \__enumext_stop_item_viii:
4465      \legacy_if:nT { @noitemarg }
4466        {
4467          \legacy_if_set_false:n { @noitemarg }
4468          \legacy_if:nT { @nmbrlist }
4469            {
4470              \bool_if:NT \l__enumext_hyperref_bool
4471                {
4472                  \legacy_if_set_true:n { @hyper@item }
4473                }
4474              \refstepcounter{enumXviii}
4475            }
4476        }
```

Here we start capturing `\item` and its contents into a group using the plain form of the `lrbox` environment.

```
4477      \group_begin:
4478        \lrbox{ \l__enumext_item_text_viii_box }
4479          \bool_if:NF \l__enumext_footnotes_key_bool
4480            {
4481              \__enumext_renew_footnote:
4482            }
4483          \bool_if:NT \l__enumext_item_starred_viii_bool
4484            {
4485              \__enumext_starred_item_exec:
4486            }
4487          \group_begin:
4488            \tl_use:N \l__enumext_label_font_style_viii_tl
4489            \bool_if:NTF \l__enumext_wrap_label_viii_bool
4490              {
4491                \makebox[ \l__enumext_labelwidth_viii_dim ][ \l__enumext_align_label_viii_str ]
4492                  { \__enumext_wrapper_label_viii:n {#1} }
4493              }
4494              {
4495                \makebox[ \l__enumext_labelwidth_viii_dim ][ \l__enumext_align_label_viii_str ]{ #1
```

```
4496              }
4497         \group_end:
4498         \skip_horizontal:N \l__enumext_labelsep_viii_dim
4499         \tl_use:N \l__enumext_after_list_args_viii_tl
4500         \__enumext_minipage:w [ t ]{ \l__enumext_joined_width_viii_dim  }
4501           \skip_set_eq:NN \parindent \l__enumext_listparindent_viii_dim
4502           \skip_set_eq:NN \parskip \l__enumext_parsep_viii_skip
4503           \bool_if:NT \l__enumext_item_starred_viii_bool
4504             {
4505                \tl_use:N \l__enumext_fake_item_indent_viii_tl
4506                \__enumext_keyans_show_item_opt:
4507                \skip_horizontal:n { -\l__enumext_fake_item_indent_viii_dim - \l__enumext_labelsep_
4508             }
4509             {
4510                \tl_use:N \l__enumext_fake_item_indent_viii_tl
4511             }
4512      }
```

(*End of definition for* `\__enumext_start_item_viii:w`.)

`\__enumext_stop_item_viii:` The function `\__enumext_stop_item_viii:` shall terminate with the capture of `\item` and its ⟨*contents*⟩. Close the environments `minipage`, `lrbox` and the group. Then we only have to set the width of the box and print it next to `\footnote`, and add the horizontal and vertical separation between the boxes.

```
4513  \cs_new_protected_nopar:Nn \__enumext_stop_item_viii:
4514    {
4515          \__enumext_endminipage:
4516        \endlrbox
4517      \group_end:
4518      \box_set_wd:Nn \l__enumext_item_text_viii_box
4519        {
4520          \l__enumext_joined_width_viii_dim
4521          + \l__enumext_labelwidth_viii_dim
4522          + \l__enumext_labelsep_viii_dim
4523        }
4524      \int_set:Nn \hbadness { 10000 }
4525      \box_use_drop:N \l__enumext_item_text_viii_box
4526      \bool_if:NF \l__enumext_footnotes_key_bool
4527        {
4528          \__enumext_print_footnote:
4529        }
4530      \int_compare:nNnTF
4531        { \l__enumext_item_column_pos_viii_int } = { \l__enumext_columns_viii_int }
4532        {
4533          \par\noindent
4534          \int_zero:N \l__enumext_item_column_pos_viii_int
4535        }
4536        { \hspace{ \l__enumext_columns_sep_viii_dim } }
4537    }
```

(*End of definition for* `\__enumext_stop_item_viii:`.)

`\__enumext_remove_extra_parsep_viii:` Finally we will remove the vertical space equal to `\parsep` when the total number of items is divisible by the number of items in the last row of the environment.

```
4538  \cs_new_protected:Nn \__enumext_remove_extra_parsep_viii:
4539    {
4540      \int_compare:nNnT
4541        {
4542          \int_mod:nn
4543            { \g__enumext_item_count_all_viii_int }
4544            { \l__enumext_columns_viii_int }
4545        }
4546        =
4547        { 0 }
4548        {
4549          \par
4550          \vspace{ -\l__enumext_itemsep_viii_skip }
4551          \int_gzero:N \g__enumext_item_count_all_viii_int
4552        }
4553    }
```

(*End of definition for* `\__enumext_remove_extra_parsep_viii:`.)

11.45 The command \getkeyans

\getkeyans The \getkeyans command takes a mandatory argument of the form {⟨*store name : position*⟩}. Retrieve a "*single*" content stored by \anskey, \anspic* and \item* from ⟨*prop list*⟩ defined by save-ans key.

```
4554 \NewDocumentCommand \getkeyans { m }
4555   {
4556     \exp_args:Ne \__enumext_getkeyans_aux:n
4557       { \tl_to_str:e { \text_expand:n {#1} } }
4558   }
```

(*End of definition for* \getkeyans. *This function is documented on page* 16.)

__enumext_getkeyans_aux:n The internal function __enumext_getkeyans_aux:n is in charge of *splitting* the ⟨*argument*⟩ using ":". If ":" is omitted it will return an error.

```
4559 \cs_new_protected:Npn \__enumext_getkeyans_aux:n #1
4560   {
4561     \str_if_in:nnTF {#1} { : }
4562       {
4563         \use:e
4564           {
4565             \cs_set:Npn \exp_not:N \__enumext_tmp:w ##1 \c_colon_str ##2 \scan_stop:
4566               { {##1} {##2} }
4567           }
4568         \exp_after:wN \__enumext_getkeyans:nn \__enumext_tmp:w #1 \scan_stop:
4569       }
4570     { \msg_error:nnn { enumext } { missing-colon } {#1} }
4571   }
```

(*End of definition for* __enumext_getkeyans_aux:n.)

__enumext_getkeyans:nn The internal function __enumext_getkeyans:nn will check for the existence of the ⟨*prop list*⟩, if it does not exist it will return an error message, then it will fetch the content specified by the second ⟨*argument*⟩ from ⟨*prop list*⟩.

```
4572 \cs_new_protected:Npn \__enumext_getkeyans:nn #1 #2
4573   {
4574     \prop_if_exist:cF { g__enumext_#1_prop }
4575       { \msg_error:nnn { enumext } { undefined-storage-anskey } {#1} }
4576     \group_begin:
4577       \prop_item:cn { g__enumext_#1_prop }{#2}
4578     \group_end:
4579   }
```

(*End of definition for* __enumext_getkeyans:nn.)

11.46 The command \printkeyans

The \printkeyans command prints "*all stored content*" in the ⟨*sequence*⟩ defined by the save-ans key. The first thing we will do is define a set of ⟨*filtered keys*⟩ with which we will control the options of the different nesting levels for the environment enumext and enumext* by storing their values in the list of tokens \l__enumext_print_keyans_X_tl.

The variable \l__enumext_print_keyans_starred_tl will have the default ⟨*keys*⟩ for \printkeyans* and will be set by \setenumext[⟨*print**⟩] and the variable \l__enumext_print_keyans_vii_tl will have the default keys for the environment enumext* nested within the ⟨*sequence*⟩ and will be set by \setenumext[⟨*print ,**⟩], the rest of the variables will be for the environment enumext and will be set by \setenumext[⟨*print , level*⟩].

```
4580 \keys_define:nn  { enumext / print }
4581   {
4582     print*  .code:n      = \keys_precompile:neN { enumext / enumext* }
4583                             { \__enumext_filter_save_key:n {#1} }
4584                             \l__enumext_print_keyans_starred_tl, % starred cmd
4585     print*  .initial:n  = { nosep, label=\arabic*., columns=2, first=\small, font=\small },
4586     print-1 .code:n     = \keys_precompile:neN { enumext / level-1 }
4587                             { \__enumext_filter_save_key:n {#1} }
4588                             \l__enumext_print_keyans_i_tl,
4589     print-1 .initial:n  = { nosep, label=\arabic*., columns=2, first=\small, font=\small },
4590     print-2 .code:n     = \keys_precompile:neN { enumext / level-2 }
4591                             { \__enumext_filter_save_key:n {#1} }
4592                             \l__enumext_print_keyans_ii_tl,
4593     print-2 .initial:n  = { nosep, label=(\alph*), first=\small, font=\small },
4594     print-3 .code:n     = \keys_precompile:neN { enumext / level-3 }
4595                             { \__enumext_filter_save_key:n {#1} }
```

```
4596                              \l__enumext_print_keyans_iii_tl,
4597       print-3 .initial:n  = { nosep, label=\roman*., first=\small, font=\small },
4598       print-4 .code:n     = \keys_precompile:neN { enumext / level-4 }
4599                              { \__enumext_filter_save_key:n {#1} }
4600                              \l__enumext_print_keyans_iv_tl,
4601       print-4 .initial:n  = { nosep, label=\Alph*., first=\small, font=\small },
4602       print-* .code:n     = \keys_precompile:neN { enumext / enumext* }
4603                              { \__enumext_filter_save_key:n {#1} }
4604                              \l__enumext_print_keyans_vii_tl, % starred nested
4605       print-* .initial:n  = { nosep, label=\arabic*., first=\small, font=\small },
4606    }
```

💣 The reason for storing ⟨keys⟩ in token lists using \keys_precompile:neN is because the keys are set via \setenumext but are later executed by running the command \printkeyans and they are not handled directly by its optional argument, except those related to the first opening level.

\printkeyans   Create a user command to print *"all stored content"* in ⟨sequence⟩ for \anskey, anskey*, \item* and \anspic*. Within a group we will run our *"precompiled keys"* and then call the internal function __enumext_printkeyans:nnn.

```
4607  \NewDocumentCommand \printkeyans { s O{} m }
4608    {
4609      \group_begin:
4610        \tl_use:N \l__enumext_print_keyans_i_tl
4611        \tl_use:N \l__enumext_print_keyans_ii_tl
4612        \tl_use:N \l__enumext_print_keyans_iii_tl
4613        \tl_use:N \l__enumext_print_keyans_iv_tl
4614        \tl_use:N \l__enumext_print_keyans_vii_tl
4615        \__enumext_printkeyans:nnn { #1 } { #2 } { #3 }
4616      \group_end:
4617    }
```

(*End of definition for* \printkeyans. *This function is documented on page 16.*)

__enumext_printkeyans:nnn   The internal function __enumext_printkeyans:nnn will check for the existence of the ⟨sequence⟩, if it does not exist it will return an error message, then it will check if not empty.

```
4618  \cs_new_protected:Npn \__enumext_printkeyans:nnn #1 #2 #3
4619    {
4620      \seq_if_exist:cTF { g__enumext_#3_seq }
4621        {
4622          \seq_if_empty:cF { g__enumext_#3_seq }
4623            {
4624              %%\seq_show:c { g__enumext_#3_seq }
```

If the starred argument is present we will check that the environment enumext* is not saved in the ⟨sequence⟩, then execute the variable \l__enumext_print_keyans_starred_tl that contains the default ⟨keys⟩ for the environment enumext*, it will open the environment enumext* passing the optional argument to the *"first level"*, set the key base-fix and then will map the ⟨sequence⟩.

```
4625              \bool_if:nTF {#1}
4626                {
4627                  \seq_if_in:cnTF { g__enumext_#3_seq } { \end{enumext*} }
4628                    {
4629                      \msg_error:nnnn { enumext } { print-starred } {#3} { enumext* }
4630                    }
4631                    {
4632                      \tl_use:N \l__enumext_print_keyans_starred_tl
4633                      \begin{enumext*}[#2]
4634                        \keys_set:nn { enumext / level-1 }{ base-fix }
4635                        \seq_map_inline:cn { g__enumext_#3_seq } { ##1 }
4636                      \end{enumext*}
4637                    }
4638                }
```

Otherwise it will open the environment enumext passing the optional argument to the *"first level"*, set the key base-fix and then map the ⟨sequence⟩.

```
4639                {
4640                  \begin{enumext}[#2]
4641                    \keys_set:nn { enumext / enumext* }{ base-fix }
4642                    \seq_map_inline:cn { g__enumext_#3_seq } { ##1 }
4643                  \end{enumext}
4644                }
4645            }
```

```
4646          }
4647        {
4648          \msg_error:nnn { enumext } { undefined-storage-anskey } {#3}
4649        }
4650    }
```

(*End of definition for* __enumext_printkeyans:nnn.)

11.47   The command \setenumext

The command \setenumext will be in charge of managing the ⟨*keys*⟩ passed to all environments and to the \printkeyans command. We must take precautions with the enumext* environment and *"first level"* of the enumext environment so as not to capture ⟨*keys*⟩ that complicate us.

__enumext_filter_first_level:n
__enumext_filter_first_level_key:n
__enumext_filter_first_level_pair:nn

The function __enumext_filter_first_level:n will be in charge of filtering the ⟨*keys*⟩ passed to the environment enumext* and *"first level"* of the environment enumext.

```
4651  \cs_new:Npn \__enumext_filter_first_level:n #1
4652    {
4653      \use:e
4654        {
4655          \keyval_parse:NNn
4656            \__enumext_filter_first_level_key:n
4657            \__enumext_filter_first_level_pair:nn {#1}
4658        }
4659    }
```

The function __enumext_filter_first_level_key:n will be responsible for filtering the ⟨*keys*⟩ that are passed *"without value"* by excluding the keys resume and resume*.

```
4660  \cs_new:Npn \__enumext_filter_first_level_key:n #1
4661    {
4662      \str_case:nnF {#1}
4663        {
4664          { resume   } {}
4665          { resume*  } {}
4666        }
4667        { , { \exp_not:n {#1} } }
4668    }
```

The function __enumext_filter_first_level_pair:nn will be responsible for filtering the ⟨*keys*⟩ that are passed *"with value"* by excluding the series, resume and save-ans keys.

```
4669  \cs_new:Npn \__enumext_filter_first_level_pair:nn #1#2
4670    {
4671      \str_case:nnF {#1}
4672        {
4673          { series } {}
4674          { resume } {}
4675          { save-ans } {}
4676        }
4677        { , { \exp_not:n {#1} } = { \exp_not:n {#2} } }
4678    }
```

(*End of definition for* __enumext_filter_first_level:n, __enumext_filter_first_level_key:n, *and* __enumext_-filter_first_level_pair:nn.)

Now define a *"meta families"* of ⟨*keys*⟩ to access from \setenumext.

```
4679  \keys_define:nn { enumext / meta-families }
4680    {
4681      enumext-1 .code:n =
4682              {
4683                \keys_set:ne { enumext / level-1  }
4684                  {
4685                    \__enumext_filter_first_level:n {#1}
4686                  }
4687              } ,
4688      enumext-2 .code:n = { \keys_set:nn { enumext / level-2  } {#1} } ,
4689      enumext-3 .code:n = { \keys_set:nn { enumext / level-3  } {#1} } ,
4690      enumext-4 .code:n = { \keys_set:nn { enumext / level-4  } {#1} } ,
4691      keyans    .code:n = { \keys_set:nn { enumext / keyans   } {#1} } ,
4692      enumext*  .code:n =
4693              {
4694                \keys_set:ne { enumext / enumext* }
4695                  {
4696                    \__enumext_filter_first_level:n {#1}
```

```
4697                          }
4698                      } ,
4699        keyans*    .code:n = { \keys_set:nn { enumext / keyans*  } {#1} } ,
4700        print*     .code:n = { \keys_set:nn { enumext / print    } { print*  = {#1} } } ,
4701        print-1    .code:n = { \keys_set:nn { enumext / print    } { print-1 = {#1} } } ,
4702        print-2    .code:n = { \keys_set:nn { enumext / print    } { print-2 = {#1} } } ,
4703        print-3    .code:n = { \keys_set:nn { enumext / print    } { print-3 = {#1} } } ,
4704        print-4    .code:n = { \keys_set:nn { enumext / print    } { print-4 = {#1} } } ,
4705        print-*    .code:n = { \keys_set:nn { enumext / print    } { print-* = {#1} } } ,
4706        unknown    .code:n = { \msg_error:nn { enumext } { unknown-key-family } } ,
4707      }
```

We store them in the constant sequence \c__enumext_all_families_seq separated by commas.

```
4708  \seq_const_from_clist:Nn \c__enumext_all_families_seq
4709    {
4710      enumext-1, enumext-2, enumext-3, enumext-4, keyans, enumext*,
4711      keyans*, print-1, print-2, print-3, print-4, print-*, print*,
4712    }
```

\setenumext   Now we define the user command \setenumext.

```
4713  \NewDocumentCommand \setenumext { O{enumext,1} +m }
4714    {
4715      \tl_if_novalue:nTF {#1}
4716        {
4717          \seq_map_inline:Nn \c__enumext_all_families_seq
4718        }
4719        {
4720          \seq_clear:N \l__enumext_setkey_tmpa_seq
4721          \seq_set_from_clist:Nn \l__enumext_setkey_tmpb_seq {#1}
4722          \int_set:Nn \l__enumext_setkey_tmpa_int
4723            {
4724              \seq_count:N \l__enumext_setkey_tmpb_seq
4725            }
4726          \int_compare:nNnTF { \l__enumext_setkey_tmpa_int } > { 1 }
4727            {
4728              \seq_pop_left:NN \l__enumext_setkey_tmpb_seq \l__enumext_setkey_tmpa_tl
4729              \seq_map_function:NN \l__enumext_setkey_tmpb_seq \__enumext_set_parse:n
4730              \seq_set_map_e:NNn \l__enumext_setkey_tmpa_seq \l__enumext_setkey_tmpa_seq
4731                {
4732                  \tl_use:N \l__enumext_setkey_tmpa_tl - ##1
4733                }
4734            }
4735            {
4736              \seq_put_right:Ne \l__enumext_setkey_tmpa_seq { \tl_trim_spaces:n {#1} }
4737            }
4738          \seq_if_empty:NTF \l__enumext_setkey_tmpa_seq
4739            { \seq_map_inline:Nn \c__enumext_all_families_seq }
4740            { \seq_map_inline:Nn \l__enumext_setkey_tmpa_seq }
4741        }
4742        {
4743          \keys_set:nn { enumext / meta-families } { ##1 = {#2} }
4744        }
4745    }
```

(*End of definition for* \setenumext. *This function is documented on page* 6.)

__enumext_set_parse:n   Internal functions used by the \setenumext command.
__enumext_set_error:nn

```
4746  \cs_new_protected:Npn \__enumext_set_parse:n #1
4747    {
4748      \tl_set:Ne \l__enumext_setkey_tmpb_tl { \tl_trim_spaces:n {#1} }
4749      \clist_map_inline:nn { 0, 1, 2, 3, 4, * } % <- max level
4750        { \tl_remove_all:Nn \l__enumext_setkey_tmpb_tl {##1} }
4751      \tl_if_empty:NTF \l__enumext_setkey_tmpb_tl
4752        {
4753          \seq_put_right:Ne \l__enumext_setkey_tmpa_seq
4754            { \tl_trim_spaces:n {#1} }
4755        }
4756        { \__enumext_set_error:nn {#1} { } }
4757    }
4758  \cs_new_protected:Npn \__enumext_set_error:nn #1 #2
4759    { \msg_error:nnn { enumext } { invalid-key } {#1} {#2} }
```

(*End of definition for* __enumext_set_parse:n *and* __enumext_set_error:nn.)

11.48   Messages

Message used by package-load for `multicol` and `hyperref` packages.

```
4760  \msg_new:nnn { enumext } { package-load }
4761    {
4762      The ~ '#1' ~ package ~ is ~ already ~ loaded.
4763    }
4764  \msg_new:nnn { enumext } { package-not-load }
4765    {
4766      The ~ '#1' ~ package ~ will ~ be ~ loaded ~ as ~ a ~ dependency.
4767    }
4768  \msg_new:nnn { enumext } { package-load-foot }
4769    {
4770      The ~ '#1' ~ package ~ is ~ loaded ~ with ~ the ~ option ~ '#2'.
4771    }
```

Message used in the creation of counters by enumext package.

```
4772  \msg_new:nnn { enumext } { counters }
4773    {
4774      The ~ counter ~ '#1' ~ is ~ already ~ defined ~ by ~ some ~ \\
4775      package ~ or ~ macro, ~ it ~ cannot ~ be ~ continued.
4776    }
```

Message used by `align` and `mark-pos` keys.

```
4777  \msg_new:nnn { enumext } { unknown-choice }
4778    {
4779      The ~ value ~ '#3' ~ for ~ '#1' ~ key ~ is ~ invalid ~ use ~ ('#2').
4780    }
```

Message used by reserved anskey* environment by enumext package.

```
4781  \msg_new:nnnn { enumext } { anskey-env-error }
4782    {
4783      The ~ '#1' ~ environment ~is ~ reserved ~ by ~\\
4784      'enumext' ~ package, ~ It~ is~ already~ defined.
4785    }
4786    {
4787      The ~ anskey* ~ environment ~ is ~ defined ~ internally ~
4788      for ~ the ~ 'save-ans' ~ key.\\
4789    }
```

Message used in the creation of ⟨*prop list*⟩ by enumext package.

```
4790  \msg_new:nnn { enumext } { store-prop }
4791    {
4792      * ~ Package ~ enumext: ~ Creating ~
4793      \c_backslash_str g__enumext_#1_prop ~ \msg_line_context:.
4794    }
4795  \msg_new:nnn { enumext } { store-seq }
4796    {
4797      * ~ Package ~ enumext: ~ Creating ~
4798      \c_backslash_str g__enumext_#1_seq ~ \msg_line_context:.
4799    }
4800  \msg_new:nnn { enumext } { store-int }
4801    {
4802      * ~ Package ~ enumext: ~ Creating ~
4803      \c_backslash_str g__enumext_resume_#1_int ~ \msg_line_context:.
4804    }
4805  \msg_new:nnn { enumext } { prop-seq-int-hook }
4806    {
4807      * ~ Package ~ enumext: ~ Elements ~ in ~
4808      \c_backslash_str g__enumext_#1_prop ~ = ~ #2.\\
4809      * ~ Package ~ enumext: ~ Elements ~ in ~
4810      \c_backslash_str g__enumext_#1_seq ~ = ~ #3.\\
4811      * ~ Package ~ enumext: ~ Value ~ off ~
4812      \c_backslash_str g__enumext_resume_#1_int ~ = ~ #4.
4813    }
4814  \msg_new:nnn { enumext } { item-answer-hook }
4815    {
4816      * ~ Package ~ enumext: ~ Value ~ off ~
4817      \c_backslash_str g__enumext_item_number_int ~ = ~ #1.\\
4818      * ~ Package ~ enumext: ~ Value ~ off ~
4819      \c_backslash_str g__enumext_item_anskey_int ~ = ~ #2.\\
4820      * ~ Package ~ enumext: ~ Difference ~ item_number_int ~ - ~ item_anskey_int ~ = ~ #3.
4821    }
```

Message used by [⟨*key = val*⟩] system and `\setenumext` command.

```
4822 \msg_new:nnn { enumext } { invalid-key }
4823   {
4824     The ~ key ~ '#1' ~ is ~ not ~ know ~ the ~ level ~ #2.
4825   }
4826 \msg_new:nnn { enumext } { unknown-key-family }
4827   {
4828     Unknown~key~family~`\l_keys_key_str'~for~enumext.
4829   }
```

Messages used in length calculation.

```
4830 \msg_new:nnn { enumext } { width-negative }
4831   {
4832     Ignoring ~ negative ~ value ~ '#1=#2' ~ \msg_line_context:.\\
4833     The ~ key ~ '#1'~ accepts ~ values  ~ >= ~ 0pt.
4834   }
4835 \msg_new:nnn { enumext } { width-zero }
4836   {
4837     Invalid ~ '#1=#2' ~ \msg_line_context:.\\
4838     The ~ key ~ '#1'~ accepts ~ values  ~ > ~ 0pt.
4839   }
```

Messages used by `show-length` key in `enumext`.

```
4840 \msg_new:nnn { enumext } { list-lengths }
4841   {
4842     **** ~ Lengths ~ used ~ by ~ 'enumext' ~ level ~ '#2' ~ \msg_line_context:~\c_space_tl ****\\
4843     \__enumext_show_length:nnn { dim  } { labelsep      } {#1}
4844     \__enumext_show_length:nnn { dim  } { labelwidth    } {#1}
4845     \__enumext_show_length:nnn { dim  } { itemindent    } {#1}
4846     \__enumext_show_length:nnn { dim  } { leftmargin    } {#1}
4847     \__enumext_show_length:nnn { dim  } { rightmargin   } {#1}
4848     \__enumext_show_length:nnn { dim  } { listparindent } {#1}
4849     \__enumext_show_length:nnn { skip } { topsep     } {#1}
4850     \__enumext_show_length:nnn { skip } { parsep     } {#1}
4851     \__enumext_show_length:nnn { skip } { partopsep } {#1}
4852     \__enumext_show_length:nnn { skip } { itemsep    } {#1}
4853     *************************************************
4854   }
```

Messages used by `show-length` key in `enumext*`, `keyans*` and `keyans`.

```
4855 \msg_new:nnn { enumext } { list-lengths-not-nested }
4856   {
4857     **** ~ Lengths ~ used ~ by ~ '#2' ~ environment ~ \msg_line_context:~\c_space_tl ****\\
4858     \__enumext_show_length:nnn { dim  } { labelsep      } {#1}
4859     \__enumext_show_length:nnn { dim  } { labelwidth    } {#1}
4860     \__enumext_show_length:nnn { dim  } { itemindent    } {#1}
4861     \__enumext_show_length:nnn { dim  } { leftmargin    } {#1}
4862     \__enumext_show_length:nnn { dim  } { rightmargin   } {#1}
4863     \__enumext_show_length:nnn { dim  } { listparindent } {#1}
4864     \__enumext_show_length:nnn { skip } { topsep     } {#1}
4865     \__enumext_show_length:nnn { skip } { parsep     } {#1}
4866     \__enumext_show_length:nnn { skip } { partopsep } {#1}
4867     \__enumext_show_length:nnn { skip } { itemsep    } {#1}
4868     *************************************************
4869   }
```

Messages used by `ref` key.

```
4870 \msg_new:nnn { enumext } { key-ref-empty }
4871   {
4872     Key ~ 'ref' ~ need ~ a ~ value ~ in ~ '#1'~ \msg_line_context:.
4873   }
```

Messages used by `save-ans` key.

```
4874 \msg_new:nnn { enumext } { save-ans-empty }
4875   {
4876     Key ~ 'save-ans' ~ need ~ a ~ value ~ in ~ '#1'~ \msg_line_context:.
4877   }
4878 \msg_new:nnn { enumext } { save-ans-log }
4879   {
4880     * ~ Package ~ enumext: ~ Start ~ #1\c_space_tl with ~ save-ans=#2 ~ \msg_line_context:.
4881   }
4882 \msg_new:nnn { enumext } { save-ans-log-hook }
4883   {
```

```
4884      * ~ Package ~ enumext: ~ Stop ~ #1\c_space_tl with ~ save-ans=#2 ~ \msg_line_context:.
4885    }
4886 \msg_new:nnn { enumext } { save-ans-hook }
4887    {
4888      Stop ~ storing ~ for ~ 'save-ans=#1' ~ \msg_line_context:.
4889    }
```

Messages used by the internal system to check answer used by check-ans key.

```
4890 \msg_new:nnn { enumext } { need-save-ans }
4891    {
4892      Key ~ '#1'~ works ~ only ~ with ~ the ~ 'save-ans' ~ key ~ in ~ '#2'~ \msg_line_context:.
4893    }
4894 \msg_new:nnn { enumext } { items-same-answer }
4895    {
4896      ****************************************\\
4897      * ~ Package ~ enumext: ~ Checking ~ answers ~ in ~ '#1' ~
4898      for ~ \c_left_brace_str #2 \c_right_brace_str\\
4899      * ~ started ~ #3 ~ and ~ close ~ \msg_line_context: : ~
4900      'OK', ~ all ~ items ~ with ~ answer.\\
4901      ****************************************
4902    }
4903 \msg_new:nnn { enumext } { item-greater-answer }
4904    {
4905      Checking ~ answers ~ in ~ '#1' ~ for ~ \c_left_brace_str #2 \c_right_brace_str\\
4906      started ~ #3 ~ and ~ close ~ \msg_line_context: : ~'NOT ~ OK'\\
4907      Items ~ > ~ Answers.
4908    }
4909 \msg_new:nnn { enumext } { item-less-answer }
4910    {
4911      Checking ~ answers ~ in ~ '#1' ~ for ~ \c_left_brace_str #2 \c_right_brace_str\\
4912      started ~ #3 ~ and ~ close ~ \msg_line_context: : ~'NOT ~ OK'\\
4913      Items ~ < ~ Answers.
4914    }
```

Messages used by the internal system to check for *"starred"* \item* and \anspic* commands.

```
4915 \msg_new:nnn { enumext } { missing-starred }
4916    {
4917      Missing ~ '\c_backslash_str #1*' ~ #2.
4918    }
4919 \msg_new:nnn { enumext } { many-starred }
4920    {
4921      Many ~ '\c_backslash_str #1*' ~ #2.
4922    }
```

Messages used by \printkeyans* command.

```
4923 \msg_new:nnn { enumext } { print-starred }
4924    {
4925      \c_backslash_str printkeyans*:~ The ~ sequence ~ '#1' ~ already ~ contains ~
4926      #2 ~ environment ~  \msg_line_context:.
4927    }
```

Message for the nesting depth of the environment enumext.

```
4928 \msg_new:nnn { enumext } { list-too-deep }
4929    {
4930      Too ~ deep ~ nesting  ~ for ~ 'enumext' ~ \msg_line_context:.~ \\
4931      The ~ maximum  ~ level  ~ of  ~ nesting  ~ is ~ 4.
4932    }
```

Messages used by \anskey, anskey* and \anspic commands.

```
4933 \msg_new:nnn { enumext } { anskey-unnumber-item }
4934    {
4935      Can't ~ store ~ with ~ a ~ unnumbered ~ \c_backslash_str item ~ \msg_line_context:.
4936    }
4937 \msg_new:nnn { enumext } { anskey-already-stored }
4938    {
4939      Content ~ already ~ stored ~ for ~ this ~ \c_backslash_str item ~ \msg_line_context:.
4940    }
4941 \msg_new:nnn { enumext } { anskey-empty-arg }
4942    {
4943      Can't ~ store ~ empty ~ content ~ \msg_line_context:.
4944    }
4945 \msg_new:nnn { enumext } { anskey-wrong-place }
4946    {
```

```
4947        Wrong ~ place ~ for ~ command ~ '\c_backslash_str #1' ~ \msg_line_context:.~ \\
4948        '\c_backslash_str #1' ~ works ~ in ~ the ~ environment ~ '#2'.
4949      }
4950 \msg_new:nnn { enumext } { anskey-nested }
4951    {
4952      The ~ command ~ \c_backslash_str anskey~ can't ~ be ~ nested ~ \msg_line_context:.
4953    }
4954 \msg_new:nnn { enumext } { anskey-math-mode }
4955    {
4956      #1 ~ can't ~ work ~ in ~ math ~ mode ~ \msg_line_context:.
4957    }
4958 \msg_new:nnn { enumext } { anskey-env-wrong }
4959    {
4960      The ~ environment ~ anskey* ~ cannot ~ use ~ in ~ '#1' ~ \msg_line_context:.
4961    }
4962 \msg_new:nnn { enumext } { anspic-wrong-place }
4963    {
4964      Wrong ~ place ~ for ~ command ~ '\c_backslash_str #1' ~ \msg_line_context:.~ \\
4965      '\c_backslash_str #1' ~ works ~ in ~ the ~ environment ~ '#2'.
4966    }
4967 \msg_new:nnn { enumext } { command-wrong-place }
4968    {
4969      Wrong ~ place ~ for ~ command ~ '\c_backslash_str #1' ~ \msg_line_context:.~ \\
4970      '\c_backslash_str #1' ~ works ~ outside ~ the ~ environment ~ '#2'.
4971    }
4972 \msg_new:nnnn { enumext } { anskey-env-key-unknown }
4973    {
4974      The ~ key ~ '#1' ~ is ~ unknown ~ by ~ environment~
4975      'anskey*' ~ and ~ is ~ being ~ ignored.
4976    }
4977    {
4978      The ~ environment ~ 'anskey*' ~ does ~ not ~ have ~ a ~ key ~ called ~'#1'.\\
4979      Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
4980    }
4981 \msg_new:nnnn { enumext } { anskey-env-key-value-unknown }
4982    {
4983      The ~ key ~ '#1=#2' ~ is ~ unknown ~ by ~ environment ~
4984      'anskey*' ~ and ~ is ~ being ~ ignored.
4985    }
4986    {
4987      The ~ environment ~ 'anskey*' ~ does ~ not ~ have ~ a ~ key ~ called ~'#1'.\\
4988      Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
4989    }
4990 \msg_new:nnnn { enumext } { anskey-cmd-key-unknown }
4991    { The ~ key ~'#1'~ is ~ unknown ~ by ~ '\c_backslash_str anskey' ~ and ~ is ~ being ~ ignored.}
4992    {
4993      The ~ command ~'\c_backslash_str anskey' ~ does ~ not ~ have ~ a ~ key ~ called ~'#1'.\\
4994      Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
4995    }
4996 \msg_new:nnnn { enumext } { anskey-cmd-key-value-unknown }
4997    { The ~ key ~ '#1=#2' ~ is ~ unknown ~ by ~ '\c_backslash_str anskey' ~ and ~ is ~ being ~ igno
4998    {
4999      The ~ command ~ '\c_backslash_str anskey' ~ does ~ not ~ have ~ a ~ key ~ called ~'#1'.\\
5000      Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
5001    }
```

Messages used by keyans, keyans* and keyanspic environment.

```
5002 \msg_new:nnn { enumext } { keyans-nested }
5003    {
5004      The ~ environment ~ 'keyans' ~ can't ~ be  ~ nested  ~ \msg_line_context:.
5005    }
5006 \msg_new:nnn { enumext } { keyans-wrong-level }
5007    {
5008      Wrong ~ level ~ position ~ for ~ 'keyans' ~ \msg_line_context:.~ \\
5009      The ~ environment ~ 'keyans' ~ can ~ only ~ be ~ in ~ the ~ first ~ level.
5010    }
5011 \msg_new:nnn { enumext } { wrong-place }
5012    {
5013      Wrong ~ place ~ for ~ '#1' ~ environment ~\msg_line_context:.~ \\
5014      '#1' ~ is ~ only ~ found ~ with ~ '#2' ~  in  ~  'enumext.
5015    }
5016 \msg_new:nnn { enumext } { keyanspic-nested }
```

```
5017       {
5018         The ~ environment ~ 'keyanspic' ~ can't ~ be  ~ nested~ \msg_line_context:.~.
5019       }
5020   \msg_new:nnn { enumext } { keyanspic-wrong-level }
5021       {
5022         Wrong ~ level ~ position ~ for ~ 'keyanspic' ~ \msg_line_context:.~ \\
5023         The ~ environment ~ 'keyans' ~ can ~ only ~ be ~ in ~ the ~ first ~ level.
5024       }
5025   \msg_new:nnn { enumext } { keyanspic-item-cmd }
5026       {
5027         Can't ~ use  ~ \c_backslash_str item ~ in ~ keyanspic ~ \msg_line_context:.
5028       }
5029   \msg_new:nnnn { enumext } { keyans-unknown-key }
5030       {
5031         The ~ key ~ '#1' ~ is ~ unknown ~ by ~ environment~
5032         '\l__enumext_envir_name_tl' ~ and ~ is ~ being ~ ignored.
5033       }
5034       {
5035         The ~ environment ~ '\l__enumext_envir_name_tl' ~ does ~ not
5036         ~ have ~ a ~ key ~ called ~'#1'.\\
5037         Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
5038       }
5039   \msg_new:nnnn { enumext } { keyans-unknown-key-value }
5040       {
5041         The ~ key ~ '#1=#2' ~ is ~ unknown ~ by ~ environment ~
5042         '\l__enumext_envir_name_tl' ~ and ~ is ~ being ~ ignored.
5043       }
5044       {
5045         The ~ environment ~ '\l__enumext_envir_name_tl' ~ does ~ not
5046         ~ have ~ a ~ key ~ called ~'#1'.\\
5047         Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
5048       }
```

Message used by unknown ⟨*keys*⟩ in enumext*. environment.

```
5049   \msg_new:nnnn { enumext } { starred-unknown-key }
5050       {
5051         The ~ key ~ '#1' ~ is ~ unknown ~ by ~ environment~
5052         '\l__enumext_envir_name_tl' ~ and ~ is ~ being ~ ignored.
5053       }
5054       {
5055         The ~ environment ~ '\l__enumext_envir_name_tl' ~ does ~ not
5056         ~ have ~ a ~ key ~ called ~'#1'.\\
5057         Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
5058       }
5059   \msg_new:nnnn { enumext } { starred-unknown-key-value }
5060       {
5061         The ~ key ~ '#1=#2' ~ is ~ unknown ~ by ~ environment ~
5062         '\l__enumext_envir_name_tl' ~ and ~ is ~ being ~ ignored.
5063       }
5064       {
5065         The ~ environment ~ '\l__enumext_envir_name_tl' ~ does ~ not
5066         ~ have ~ a ~ key ~ called ~'#1'.\\
5067         Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
5068       }
```

Message used by unknown ⟨*keys*⟩ in enumext environment.

```
5069   \msg_new:nnnn { enumext } { standar-unknown-key }
5070       {
5071         The ~ key ~ '#1' ~ is ~ unknown ~ by ~ environment ~ '\l__enumext_envir_name_tl' \c_space_tl
5072         ~ on ~ level ~ \int_use:N \l__enumext_level_int \c_space_tl and ~ is ~ being ~ ignored.
5073       }
5074       {
5075         The ~ environment ~ '\l__enumext_envir_name_tl' ~ does ~ not
5076         ~ have ~ a ~ key ~ called ~'#1' ~ on ~ level ~ \int_use:N \l__enumext_level_int.\\
5077         Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
5078       }
5079   \msg_new:nnnn { enumext } { standar-unknown-key-value }
5080       {
5081         The ~ key ~ '#1=#2' ~ is ~ unknown ~ by ~ environment ~ '\l__enumext_envir_name_tl' \c_space_
5082         ~ on ~ level ~ \int_use:N \l__enumext_level_int \c_space_tl and ~ is ~ being ~ ignored.
5083       }
5084       {
```

```
5085      The ~ environment ~ '\l__enumext_envir_name_tl' ~ does ~ not
5086      ~ have ~ a ~ key ~ called ~'#1' ~ on ~ level ~ \int_use:N \l__enumext_level_int.\\
5087      Check ~ that ~ you ~ have ~ spelled ~ the ~ key ~ name ~ correctly.
5088    }
```

Messages used by \getkeyans command.

```
5089 \msg_new:nnn { enumext } { undefined-storage-anskey }
5090    {
5091      Storage ~ named ~ '#1' ~ is ~ not ~ defined ~ \msg_line_context:.
5092    }
```

Messages used by \miniright command.

```
5093 \msg_new:nnn { enumext } { missing-miniright }
5094    {
5095      Missing ~ '\c_backslash_str miniright' ~ in ~ \msg_line_context:.\\
5096      The ~ key ~ 'mini-env' ~ need ~ '\c_backslash_str miniright'.
5097    }
5098 \msg_new:nnn { enumext } { wrong-miniright-place }
5099    {
5100      Wrong ~ place ~ for ~ '\c_backslash_str miniright' ~ \msg_line_context:.~ \\
5101      Works ~ in ~ 'enumext' ~ and ~ 'keyans' ~ with ~ key ~ 'mini-env'.
5102    }
5103 \msg_new:nnn { enumext } { wrong-miniright-use }
5104    {
5105      Wrong ~ use ~ for ~ '\c_backslash_str miniright' ~ \msg_line_context:.~ \\
5106      '\c_backslash_str miniright' ~ need ~ a ~ key ~ 'mini-env'.
5107    }
5108 \msg_new:nnn { enumext } { wrong-miniright-starred }
5109    {
5110      Can't ~ use  ~ \c_backslash_str miniright ~ in ~ starred ~ environments ~ \msg_line_context:.
5111    }
5112 \msg_new:nnn { enumext } { many-miniright-used }
5113    {
5114      Can't ~ use  ~ \c_backslash_str miniright ~ more ~ than ~ once ~  \msg_line_context:.
5115    }
```

Messages used by enumext* and keyans* environments.

```
5116 \msg_new:nnn { enumext } { nested }
5117    {
5118      The ~ environment ~ \l__enumext_envir_name_tl \c_space_tl can't ~ be ~ nested ~ \msg_line_con
5119    }
5120 \msg_new:nnn { enumext } { nested-horizontal }
5121    {
5122      The ~ environment ~ \l__enumext_envir_name_tl \c_space_tl can't ~ be ~ nested ~ in ~ '#1' ~
5123    }
5124 \msg_new:nnn { enumext } { item-joined }
5125    {
5126      Items ~ joined ~ (#1) ~ > ~ #2  ~ columns ~\msg_line_context:.
5127    }
5128 \msg_new:nnn { enumext } { item-joined-columns }
5129    {
5130      Not ~ space ~ to ~ join ~ items ~ (#1) ~ > ~ #2 ~\msg_line_context:.
5131    }
```

11.49   Finish package

Finish package implementation.

```
5132 \file_input_stop:
5133 ⟨/package⟩
```

12 Index of Implementation

The italic numbers denote the pages where the corresponding entry is described, the numbers underlined and all others indicate the line on which they are implemented in the package code.