

enumext

ENUMERATE EXERCISE SHEETS

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CTAN: <https://www.ctan.org/pkg/enumext>

 <https://github.com/pablgonz/enumext>

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 the `multicol` package and the `l3seq` and `l3prop` modules.

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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 multicol, vertical alignment

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The `enumext` package loads and requires `multicol`[3] package, need to have a modern T_EX distribution such as T_EX Live or MiK_TE_X. It has been tested with the standard classes provided by L^AT_EX: `book`, `report`, `article` and `letter` on 10pt, 11pt and 12pt.

1 Introduction

In the \LaTeX 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) \LaTeX 2e 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) \LaTeX 2e 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

(B) correct

2. Second type of questions

I. $2\alpha + 2\delta = 90^\circ$

II. $\alpha = \delta$

III. $\angle EDF = 45^\circ$

(A) I only

(B) II only

(C) I and II only

(D) I and III only

(E) I, II, and III

★ 3. Third type of questions

(1) $2\alpha + 2\delta = 90^\circ$

(2) $\angle EDF = 45^\circ$

(A) value

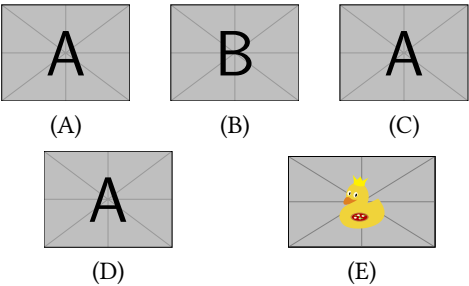
(B) value

(C) value

(D) value

(E) value

4. Question with image and label below:



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. (B)

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`[5], 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 `mktxlsr`. 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`[5] 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 in `enumext`, `enumext*`, `keyans`, `keyans*` and `keyanspic` environments, `\anskey`, `\item*` and `\anspic*` commands to \langle stored content \rangle , `\getkeyans` command to get the individual \langle stored content \rangle , `\printkeyans` to print all \langle stored content \rangle , `\miniright` for `minipage` and `\setenumext` to config all $[\langle key = val \rangle]$ 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 missing error and abort the load.

1.3.2 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.

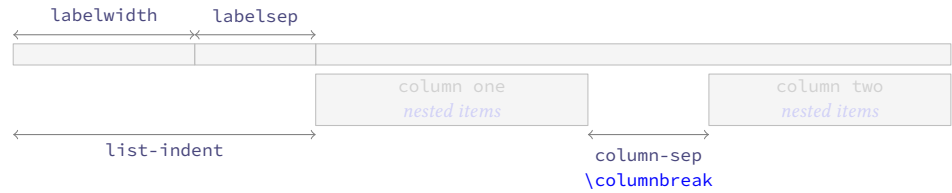


Figure 4: Representation of the two column output for a nested level in `enumext` environment.

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. The environment is available for all nesting levels, and can can together with the `mini-env` key. If you need to force a start a new column `\columnbreak` must be used (see §3.5).

- 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.

1.3.3 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 (left and right) is always used with “aligned on top” [`t`], the `minipage` environment on the “right side” always starts with `\centering`. It can be used at all nesting levels 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 `\mini-right` (see §3.6).

1.3.4 The \label and \ref system

This package provides a user interface like the `enumitem`[5] package to customize the references which is activated by the `ref` key (§3.1), the standard \TeX `\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` (§4.2) when the key `save-ans`(§4.1) is active.

- The implementation of `\label` and `\ref` together with the `save-ref` key are compatible with the `hyperref`[7] package.

1.3.5 Support for \footnote

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

The best way to solve this is to use Jean-François Burnol `footnotehyper`[8] 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 environment enumext

<code>enumext</code>	<code>\begin{enumext} [⟨keyval list⟩]</code>	<code>\begin{enumext*} [⟨keyval list⟩]</code>
<code>enumext*</code>	<code>\item ⟨item content⟩</code>	<code>\item ⟨item content⟩</code>
	<code>\item [⟨custom⟩] ⟨item content⟩</code>	<code>\item [⟨custom⟩] ⟨item content⟩</code>
	<code>\item* [⟨symbol⟩] [⟨offset⟩] ⟨item content⟩</code>	<code>\item* [⟨symbol⟩] [⟨offset⟩] ⟨item content⟩</code>
	<code>\end{enumext}</code>	<code>\end{enumext*}</code>

The `enumext` is an “*enumerated list*” environment that works in the same way as the standard `enumerate` environment provided by L^AT_EX, `\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

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.

```
\begin{enumext}
  \item This text is in the first level.
  \begin{enumext}
    \item This text is in the second level.
    \begin{enumext}
      \item This text is in the third level.
      \begin{enumext}
        \item This text is in the fourth level.
      \end{enumext}
    \end{enumext}
  \end{enumext}
  \item[X] This text is in the first level.
  \item* This text is in the first level.
\end{enumext}
```

2.1 The `\item*` in `enumext`

```
\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 value set by the `labelsep` key and can be *offset* using the second optional argument. The default values for *symbol* and *offset* are `\star$ ‘★’` and the value set by `labelsep` key.

The *starred version* ‘★’ 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` environment is NOT the same as in the `keyans` environment.

2.1.1 Keys for `\item*` in `enumext`

`item-sym*` = {*symbol*} default: `\star$`
 Sets the *symbol* to be displayed in the “left” of the box containing the current *label* set by `labelwidth` key for `\item*` in `enumext`. The *symbol* can be in text or math mode, for example `item-sym*={\star$}`.

`item-pos*` = {*rigid length* | *dim expression*} 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*.

3 The command `\setenumext`

```
\setenumext \setenumext[\enumext, level][\key = val] \setenumext[\enumext*][\key = val]
\setenumext[\print, level][\key = val] \setenumext[\keyans*][\key = val]
\setenumext[\keyans][\key = val] \setenumext[\print*][\key = val]
```

The command `\setenumext` sets the *keys* on a global basis for environment `enumext`, the `\printkeyans` command and the `keyans` environment. 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.

- It should be kept in mind that using any *key* that sets a *rubber or rigid lengths* for vertical or horizontal space on a level will influence the vertical and horizontal space for *inners levels* and *keyans* and *keyanspic* 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 `\dimexpr` or `\dimeval` to perform calculations.

3.1 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 first level are `\arabic*`, for second level are `(\alph*)`, for third level are `\roman*`, and for fourth level are `\Alph*`.

- This key is intended to give the basic structure with which the *label* will be displayed, and the 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., `\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{enumXi}` 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 \itembx { 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={\itembx{#1}}` or `wrap-label={\itembx*{#1}}`.

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

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

3.2 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`.

3.2.1 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 values for first level 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.

`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 values for first level 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.

`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 are 2.0pt plus 1.0pt minus 1.0pt, for third and fourth level are 1.0pt minus 1.0pt.

- The value of this parameter also affects the *inner levels* and the `keyans` environment. 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 values for first level are 4.0pt plus 2.0pt minus 1.0pt, for the rest of the levels are 2.0pt plus 1.0pt 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.

- 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 \TeX 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”.

3.2.2 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` 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.

3.3 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 `ℒTEX` 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 `\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⟩}\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`: `\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.

3.4 Keys for start and resume

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

Sets the *start value* of the numbering on the current level. Internally `⟨string⟩` is 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`.

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

Sets the *start* to value from the previous of the counter defined by `label` key for the “*first level*”. This `⟨key⟩` does not receive an argument. The `⟨key⟩` can be overwritten using the `start` key. If the `save-ans` key is present and `{⟨store name⟩}` exist, the numbering will continue according to this key. This key is “*only*” available for the “*first level*” of `enumext`.

3.5 Keys for multicol

`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.

3.6 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`.

3.6.1 The command `\miniright`

`\miniright` 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 version* ‘`*`’ inhibits the use of `\centering` command i.e. the usual L^AT_EX 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.

3.6.2 The key `miniright`

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

`miniright` = {⟨code for drawing or tabular⟩} default: not used
Set the *code* for the drawing or tabular to be placed in the `minipage` environment on the “right side” by starting it with the command `\centering`.

`miniright*` = {⟨code for drawing or tabular⟩} default: not used
Same as above, but *without* starting with the `\centering` command.

4 The storage system

The entire mechanism for “storing content” it is activated according to `save-ans` key on the “first level” of `enumext` environment. Only when this *key* is “active” the `\anskey` command and the environments `keyans` and `keyanspic` are available.

<pre>\begin{enumext}[save-ans={⟨store name⟩}] \item Text \begin{keyans} ... \end{keyans} \end{enumext}</pre>	<pre>\begin{enumext}[save-ans={⟨store name⟩}] \item Text \begin{keyanspic} ... \end{keyanspic} \end{enumext}</pre>
--	--

4.1 Keys for storage

`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` in `enumext` environment, `\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.

`wrap-ans` = {⟨code {#1} more code⟩} default: \fbox{#1}
Wraps the *current argument* passed `\anskey` command to referenced by {#1}. The {⟨code⟩} must be passed between braces and only affects the ⟨current argument⟩ passed to `\anskey` and NOT the “stored content” in the ⟨store name⟩ set by `save-ans` key. If this key is passed using the `\setenumext` command 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*` commands referenced by {#1} in the `keyans`, `keyans*` and `keyanspic` environments. The {⟨code⟩} must be passed between braces and only affects the current ⟨optional argument⟩ and NOT the “stored content” in ⟨store name⟩ set by `save-ans` key. If this key is passed using the `\setenumext` command, it is necessary to use the double ‘{##1}’.

`save-sep` = {⟨text symbol⟩} default: {, }
Sets the *text symbol* that will separate the current ⟨label⟩ defined by the `label` key from the ⟨optional argument⟩ (if present), when storing them in the ⟨store name⟩ defined by the `save-ans` key for the `\item*` command in the `keyans` and `keyans*` environment and for the `\anspic` command in the `keyanspic` environment. 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.

`mark-ans` = {⟨symbol⟩} default: \textasteriskcentered
Sets the *symbol* to be displayed in the left margin of the “stored content” in ⟨store name⟩ set by `save-ans` key when using `show-ans` key.

`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.

4.2 Keys for internal 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.

4.3 Keys for debugging and checking

`show-ans = {⟨true | false⟩}`

default: *false*

Displays the *current* ⟨*argument*⟩ passed to `\anskey` in `enumext` environment, the current ⟨*label*⟩ for `\item*` in `keyans` environment and the current ⟨*label*⟩ for `\anspic*` in `keyanspic` environment at the place where it is executed. If the optional argument is present in `\item*` or `\anspic*` it will be shown in square brackets.

`show-pos = {⟨true | false⟩}`

default: *false*

Displays the *position* occupied by the “*stored content*” by `\anskey` in `enumext` environment, `\item*` in `keyans` environment and `\anspic*` in `keyanspic` environment in ⟨*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. This key works under the logic that each question will contain “*only one answer*”, it is intended to be used in conjunction with `no-store` key.

`no-store ⟨value forbidden⟩`

default: *not used*

This is a *meta-key* that does not receive an argument. This key is used in conjunction with `check-ans` and is designed to be used with nested levels of `enumext` in which the `\anskey` command will not be used.

4.4 The command \anskey

`\anskey {⟨content⟩}`

The `\anskey` command takes a mandatory argument and is triggered by `save-ans` key. The “*content*” are “*stored*” in ⟨*store name*⟩ set by `save-ans` key. The command does “*not support*” verbatim content and must NOT be nested. By design it is assumed that each `\item` or `\item*` will have a “*single*” occurrence of the command unless a nested level is opened or the `no-store` key is used. If `save-ref` key are active and the `hyperref`[7] package is detected, `\hyperlink` and `\hypertarget` will be used, otherwise the usual “*label and ref*” system provided by L^AT_EX will be used.

Example

- | | |
|---|---|
| <ul style="list-style-type: none"> ★ 1. Text containing our instructions or questions. <li style="margin-left: 20px;">* first answer 2. Text containing our instructions or questions. <li style="margin-left: 20px;">(a) Question. <li style="margin-left: 40px;">* second answer | <ul style="list-style-type: none"> 3. Text containing our instructions or questions. <li style="margin-left: 20px;">* third answer 4. Text containing our instructions or questions. <li style="margin-left: 20px;">* fourth answer |
|---|---|

```
\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}
```

4.5 The environment 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` is an “*enumerated list*” environment designed for “*multiple choice*” questions activated by the `save-ans` key. This environment 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.

```
\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 $\langle keys \rangle$ set in the optional argument of the environment are the same (almost) as those of the `enumext` environment and have higher precedence than those set by `\setenumext[<keyans>]{<key = val>}`. If the optional argument is not passed or the $\langle keys \rangle$ 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 $\langle label \rangle$ which will be set to `label=(\Alph*)`.

4.5.1 The `\item*` in `keyans`

```
\item* \item*
\item* [<content>]
```

The `\item*` and `\item* [<content>]` command store the current $\langle label \rangle$ set by `label` key next to the $\langle content \rangle$ (if it is present) in $\langle store name \rangle$ set by `save-ans` key in the “first level” of the `enumext` environment. The starred version ‘`*`’ 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 starred version ‘`*`’ will only appear “once” within the environment.

🟡 The behavior of `\item*` in `keyans` environment is NOT the same as in the `enumext` environment.

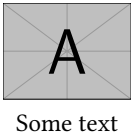
Example

```
\begin{enumext}[save-ans=test,columns=2,show-ans=true]
  \item Text containing a question.
  \begin{keyans}[nosep]
    \item Choice
    \item* Correct 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
2. Text containing a question and image.
(A) Choice
(B) Choice
(C) Choice
(D) Choice
* (E) [note] Correct choice



Some text

4.6 The environment `keyanspic`

```
keyanspic \begin{keyanspic}[<number above, number 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.

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.

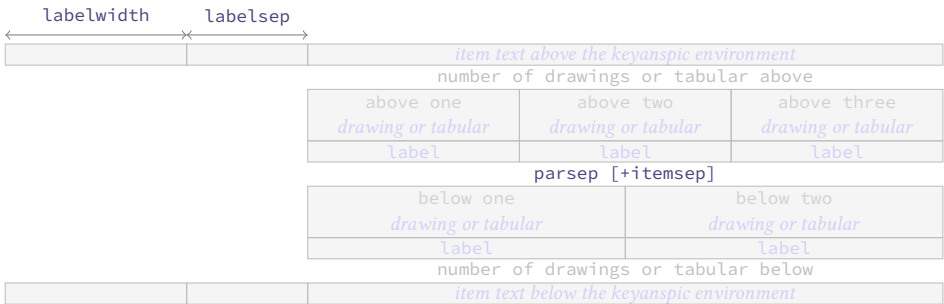


Figure 6: Representation of the `keyanspic` environment with optional argument `[3,2]` in `enumext`.

4.6.1 The command `\anspic`

```
\anspic <anspic>{<drawing or tabular>}
\anspic* [<content>]{<drawing or tabular>}
```

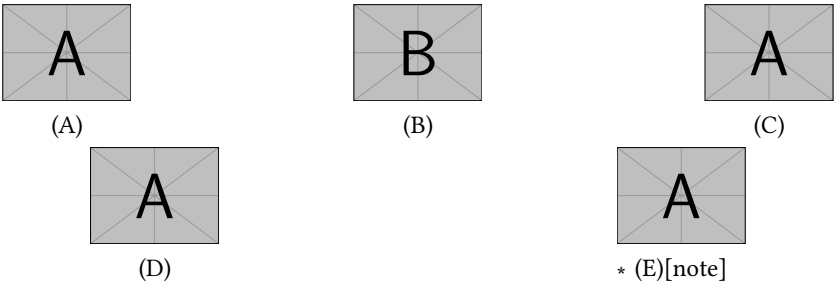
The `\anspic` command take three arguments, the *starred version* ‘`*`’ store the current `<label>` next to the `<content>` (if it is present) in `<store name>` set by `save-ans` key.

The *starred version* ‘`*`’ 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 version* ‘`*`’ 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.



4.7 Printing stored content

4.7.1 The command `\getkeyans`

```
\getkeyans <getkeyans>{<store name> : <position>}
```

The command `\getkeyans` prints the “*only stored content*” in `<store name>` defined by `save-ans` key in the `<position>` returned by the `show-pos` key.

The “*content*” can only be accessed “*after*” it is stored, if the `<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.

4.7.2 The command `\printkeyans`

```
\printkeyans <printkeyans>[<keys>]{<store name>}
```

The command `\printkeyans` prints “*all stored content*” in `{<store name>}` defined by `save-ans` key. The “*content*” can only be accessed “*after*” it is stored, if `<store name>` does not exist the command will return an error.

Internally it places the “*stored content*” inside the `enumext` environment with default values for `label` key are the same as those of the `enumext` environment along with the keys: `nosep`, `first=\small`, `font=\small` for all levels, except for the first one that adds the `columns=2` key.

The optional argument allows to handle the *keys* “on the first level” of the `enumext` environment encapsulated by the command. If need to pass options for nested levels use `\setenumext[<print , level>]{<store name>}`.

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 \LaTeXe\ 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) \LaTeXe 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
- *
- *
- *
- *
- *

5 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.
- A $1 \text{ \AA} = 1 \times 10^5$ fm.

B $1 \text{ \AA} = 1 \times 10^{-5}$ fm.

C $1 \text{ \AA} = 1 \times 10^{-15}$ fm.

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

¹The cool `TeX` automation tool: <https://www.ctan.org/pkg/arara>

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

B

C

D

$1 \text{ \AA} = 1 \times 10^5 \text{ fm.}$


$1 \text{ \AA} = 1 \times 10^{-5} \text{ fm.}$

$1 \text{ \AA} = 1 \times 10^{-15} \text{ fm.}$

$1 \text{ \AA} = 1 \times 10^3 \text{ fm.}$

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 $1,00 \times 10^2 \text{ m/s}$ espressa in km/h è:
- A

B

C

D

36 km/h.

360 km/h.

$27,8 \text{ km/h.}$

$3,60 \times 10^8 \text{ km/h.}$
2. In fisica nucleare si usa l'angstrom (simbolo: $1 \text{ \AA} = 1 \times 10^{-10} \text{ m}$) e il fermi o femtometro ($1 \text{ fm} = 1 \times 10^{-15} \text{ m}$). Qual è la relazione tra queste due unità di misura?
- A

B

C

D

$1 \text{ \AA} = 1 \times 10^5 \text{ fm.}$

$1 \text{ \AA} = 1 \times 10^{-5} \text{ fm.}$

$1 \text{ \AA} = 1 \times 10^{-15} \text{ fm.}$

$1 \text{ \AA} = 1 \times 10^3 \text{ fm.}$
3. La velocità di $1,00 \times 10^2 \text{ m/s}$ espressa in km/h è:
- A

B

C

D

36 km/h.

360 km/h.

$27,8 \text{ km/h.}$

$3,60 \times 10^8 \text{ km/h.}$
4. In fisica nucleare si usa l'angstrom (simbolo: $1 \text{ \AA} = 1 \times 10^{-10} \text{ m}$) e il fermi o femtometro ($1 \text{ fm} = 1 \times 10^{-15} \text{ m}$). Qual è la relazione tra queste due unità di misura?
- A

B

C

D

$1 \text{ \AA} = 1 \times 10^5 \text{ fm.}$

$1 \text{ \AA} = 1 \times 10^{-5} \text{ fm.}$

$1 \text{ \AA} = 1 \times 10^{-15} \text{ fm.}$

$1 \text{ \AA} = 1 \times 10^3 \text{ fm.}$

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. $2\alpha + 2\delta = 90^\circ$

II. $\alpha = \delta$

III. $\angle EDF = 45^\circ$

A

 I only

B

 II only

C

 I and II only

D

 I and III only

E

 I, II, and III
3. Third type of questions
- (1) $2\alpha + 2\delta = 90^\circ$

(2) $\angle EDF = 45^\circ$

A

 value

B

 value

C

 value

D

 value

E

 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 :) 📄.

- 1

 Factor $x^2 - 2x + 1$
- 2

 Factor $3x + 3y + 3z$
- The following questions need to be cuaqtified :)
- 3

 True False
- (a)

 $\alpha > \delta$
- (b)

~~ETX~~ze 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

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 .

<div>1</div> <p>Which choice best describes what happens in the passage?</p> <p>A) One character argues with another character who intrudes on her home.</p> <p>B) One character receives a surprising request from another character.</p> <p>C) One character reminisces about choices she has made over the years.</p> <p>D) One character criticizes another character for pursuing an unexpected course of action.</p>	<div>3</div> <p>Which choice best describes what happens in the passage?</p> <p>A) One character argues with another character who intrudes on her home.</p> <p>B) One character receives a surprising request from another character.</p> <p>C) One character reminisces about choices she has made over the years.</p> <p>D) One character criticizes another character for pursuing an unexpected course of action.</p>
<div>2</div> <p>Which choice best describes what happens in the passage?</p> <p>A) One character argues with another character who intrudes on her home.</p> <p>B) One character receives a surprising request from another character.</p> <p>C) One character reminisces about choices she has made over the years.</p> <p>D) One character criticizes another character for pursuing an unexpected course of action.</p>	<div>4</div> <p>Which choice best describes what happens in the passage?</p> <p>A) One character argues with another character who intrudes on her home.</p> <p>B) One character receives a surprising request from another character.</p> <p>C) One character reminisces about choices she has made over the years.</p> <p>D) One character criticizes another character for pursuing an unexpected course of action.</p>

1. A)

2. C)

3. B)

4. D)

6 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=0pt` 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, consectetur 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, consectetur 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, consectetur 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 \itembx { 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*={\itembx{#1}}`.

SomeThing A short one-line description.
This is an entry *without* a label.

Something A short one-line description.

Something A much longer description. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.

long vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.

SoMeThInG A much longer description. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris.

LoNg 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[4]` 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`[10] and `l3seq`[10] modules together with the `hyperref`[7] and `enumitem`[5] 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.

7 References

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8 Change history

v1.0 2024-05-15 – First public release.

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10 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 T_EXpert are superfluous, but, after so many years developing this project is the only way to remember what does what.

10.1 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.

10.2 Initial set up

Start the DocStrip guards.

```
1 (*package)
```

Identify the internal prefix (L^AT_EX3 DocStrip convention) for l3doc class.

```
2 <@@=enumext>
```

10.3 Declaration of the package

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

```
3 \NeedsTeXFormat{LaTeX2e}[2023-11-01]
```

Now declare the `enumext` package.

```
4 \ProvidesExplPackage
5   {enumext}
6   {2024-05-15}
7   {1.0}
8   {Enumerate exercise sheets}
```

Finally check if the `multicol` package is 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}[2023-03-30]
18   }
19 }
```

10.4 Definition of variables

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

Integer variables will control the nesting levels of the environments and boolean variables will be used to determine if they are present (nested) in each other. The boolean variables `\g__enumext_starred_bool` and `\g__enumext_standar_bool` will be set to “true” when the `enumext` and `enumext*` environments are not nested with each other.

```
20 \int_new:N \__enumext_level_int
21 \int_new:N \__enumext_level_h_int
22 \int_new:N \__enumext_keyans_level_int
23 \int_new:N \__enumext_keyans_level_h_int
24 \int_new:N \__enumext_keyans_pic_level_int
25 \bool_new:N \__enumext_starred_bool
26 \bool_new:N \g__enumext_starred_bool
```

```

27 \bool_new:N \l__enumext_starred_level_one_bool
28 \bool_new:N \l__enumext_standar_bool
29 \bool_new:N \g__enumext_standar_bool
30 \bool_new:N \l__enumext_standar_level_one_bool
31 \bool_new:N \l__enumext_keyans_env_bool

```

(End of definition for `\l__enumext_level_int` 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_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` and then modified by the function `__enumext_label_style:Nnn` used by `label` key (§10.8).

```

32 \cs_set_protected:Npn \__enumext_tmp:n #1
33 {
34   \tl_new:c { l__enumext_counter_#1_tl }
35 }
36 \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.)

```

\g__enumext_resume_int
\g__enumext_resume_vii_int
\g__enumext_item_symbol_tl
\g__enumext_standar_series_tl
\g__enumext_starred_series_tl

```

The boolean variable `\l__enumext_resume_bool` is used by `resume` key, the value from which the environment’s will start is stored in the integer variable `\g__enumext_resume_int` (§10.21). The global token list `\g__enumext_item_symbol_tl` is used by `item-sym*` key (§10.26).

```

37 \int_new:N \g__enumext_resume_int
38 \int_new:N \g__enumext_resume_vii_int
39 \tl_new:N \l__enumext_resume_name_tl
40 \tl_new:N \g__enumext_item_symbol_tl
41 \tl_new:N \g__enumext_standar_series_tl
42 \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` (§10.12) and `label` (§10.10) keys.

```

43 \dim_new:N \l__enumext_current_widest_dim
44 \tl_new:N \g__enumext_counter_styles_tl
45 \tl_new:N \g__enumext_widest_label_tl
46 \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 (§10.14).

The variables `\l__enumext_leftmargin_X_dim` and `\l__enumext_itemindent_X_dim` are used (and set) by the function `__enumext_calc_hspace:NNNNNNNNNN` (§10.30) which determines the internal values for `\leftmargin` and `\itemindent`.

```

47 \cs_set_protected:Npn \__enumext_tmp:n #1
48 {
49   \bool_new:c { l__enumext_leftmargin_tmp_#1_bool }
50   \dim_new:c { l__enumext_leftmargin_tmp_#1_dim }
51   \dim_new:c { l__enumext_leftmargin_#1_dim }
52   \dim_new:c { l__enumext_itemindent_#1_dim }
53 }
54 \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 §10.18).

```

55 \cs_set_protected:Npn \__enumext_tmp:n #1
56 {
57   \skip_new:c { l__enumext_multicols_above_#1_skip }
58   \skip_new:c { l__enumext_multicols_below_#1_skip }
59 }
60 \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 (§10.19.4) and the keys `miniright`, `miniright*`, `mini-env` and `mini-sep` (§10.17, §10.19).

```

61 \int_new:N \g__enumext_minipage_stat_int
62 \skip_new:N \l__enumext_minipage_left_skip
63 \skip_new:N \l__enumext_minipage_right_skip
64 \skip_new:N \l__enumext_minipage_after_skip
65 \skip_new:N \g__enumext_minipage_right_skip
66 \skip_new:N \g__enumext_minipage_after_skip
67 \cs_set_protected:Npn \__enumext_tmp:n #1
68 {
69   \dim_new:c { \l__enumext_minipage_left_#1_dim }
70   \bool_new:c { \l__enumext_minipage_active_#1_bool }
71 }
72 \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 integer variable `\l__enumext_start_X_int` are used by the `start` key (§10.12), the token list `\l__enumext_fake_item_indent_X_tl` is used by `itemindent` key, the variables `\l__enumext_label_fill_left_X_tl` and `\l__enumext_label_fill_right_X_tl` are used by the `align` key (§10.10). 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

```

73 \cs_set_protected:Npn \__enumext_tmp:n #1
74 {
75   \bool_new:c { \l__enumext_wrap_label_#1_bool }
76   \bool_new:c { \l__enumext_wrap_label_opt_#1_bool }
77   \int_new:c { \l__enumext_start_#1_int }
78   \tl_new:c { \l__enumext_fake_item_indent_#1_tl }
79   \tl_new:c { \l__enumext_label_fill_left_#1_tl }
80   \tl_new:c { \l__enumext_label_fill_right_#1_tl }
81   \bool_new:c { \l__enumext_vspace_a_star_#1_bool }
82   \bool_new:c { \l__enumext_vspace_b_star_#1_bool }
83 }
84 \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_columns_join_int
\l__enumext_store_keyans_label_tl
\l__enumext_store_keyans_item_opt_tl
\l__enumext_keyans_item_opt_tl
\l__enumext_keyans_tmpa_tl
\l__enumext_keyans_tmpb_tl
\l__enumext_keyans_tmpa_dim

```

The boolean variable `\l__enumext_store_active_bool` setting by `save-ans` key (§10.21) activates all the mechanism related to `\anskey`, `keyans`, `keyans*` and `keyanspic`.

The variable `\l__enumext_store_name_tl` sets the name for the storage in `⟨sequence⟩` and `⟨prop list⟩`, the variable `\g__enumext_store_name_tl` is just a copy of the storage name used by the `check-ans` key (§10.21).

The variable `\l__enumext_store_anskey_arg_tl` stores the contents of `\anskey` (§10.24) and the variable `\l__enumext_store_keyans_label_tl` stores the contents of `\item*` (§10.28.2) for the `keyans` and `keyans*` environments and the contents of `\anspic*` (§10.34.1) for the `keyanspic` environment.

The variable `\l__enumext_keyans_tmpa_tl` is a temporary variable used by `keyans` and `keyanspic` at various points.

```

85 \bool_new:N \l__enumext_store_active_bool
86 \tl_new:N \l__enumext_store_name_tl
87 \tl_new:N \g__enumext_store_name_tl
88 \tl_new:N \l__enumext_store_anskey_arg_tl
89 \int_new:N \l__enumext_store_columns_join_int
90 \tl_new:N \l__enumext_store_keyans_label_tl
91 \tl_new:N \l__enumext_store_keyans_item_opt_tl
92 \tl_new:N \l__enumext_keyans_item_opt_tl
93 \tl_new:N \l__enumext_keyans_tmpa_tl
94 \tl_new:N \l__enumext_keyans_tmpb_tl
95 \dim_new:N \l__enumext_keyans_tmpa_dim

```

(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` (§10.39).

```

96 \tl_new:N \l__enumext_setkey_tmpa_tl
97 \tl_new:N \l__enumext_setkey_tmpb_tl
98 \int_new:N \l__enumext_setkey_tmpa_int
99 \seq_new:N \l__enumext_setkey_tmpa_seq
100 \seq_new:N \l__enumext_setkey_tmpb_seq

```

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

```
\l__enumext_store_opt_X_tl
\l__enumext_print_keyans_X_tl
\l__enumext_store_columns_X_bool
\l__enumext_store_columns_X_int
\l__enumext_store_columns_sep_X_bool
\l__enumext_store_columns_sep_X_dim
\l__enumext_store_upper_level_X_bool
```

Internal variables used by [$\langle key = val \rangle$] in `enumext` and `enumext*` environment, the command `\printkeyans` (§10.38) and the keys `columns*` and `columns-sep*`.

```
101 \cs_set_protected:Npn \l__enumext_tmp:n #1
102 {
103   \tl_new:c { \l__enumext_store_opt_#1_tl }
104   \tl_new:c { \l__enumext_print_keyans_#1_tl }
105   \bool_new:c { \l__enumext_store_columns_#1_bool }
106   \int_new:c { \l__enumext_store_columns_#1_int }
107   \bool_new:c { \l__enumext_store_columns_sep_#1_bool }
108   \dim_new:c { \l__enumext_store_columns_sep_#1_dim }
109   \bool_new:c { \l__enumext_store_upper_level_#1_bool }
110 }
111 \clist_map_inline:nn { i, ii, iii, iv, vii } { \l__enumext_tmp:n {#1} }
```

(End of definition for `\l__enumext_store_opt_X_tl` and others.)

```
\l__enumext_show_answer_bool
\l__enumext_show_position_bool
\l__enumext_mark_ref_sym_tl
\l__enumext_mark_answer_sym_tl
\l__enumext_mark_position_str
```

Internal variables for “storage system” mechanism used by `\anskey` (§10.24), `keyans` and `keyanspic` environments. These variables are used by `show-ans`, `show-pos`, `mark-ans`, `save-key` and `mark-ref` keys (§10.23).

```
112 \bool_new:N \l__enumext_show_answer_bool
113 \bool_new:N \l__enumext_show_position_bool
114 \tl_new:N \l__enumext_mark_ref_sym_tl
115 \tl_new:N \l__enumext_mark_answer_sym_tl
116 \str_new:N \l__enumext_mark_position_str
```

(End of definition for `\l__enumext_show_answer_bool` 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 (§10.34.2).

```
117 \seq_new:N \l__enumext_keyans_pic_body_seq
118 \dim_new:N \l__enumext_keyans_pic_width_dim
119 \int_new:N \l__enumext_keyans_pic_above_int
120 \int_new:N \l__enumext_keyans_pic_below_int
121 \skip_new:N \l__enumext_keyans_pic_above_skip
```

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

```
\l__enumext_store_ans_bool
\l__enumext_check_ans_bool
\g__enumext_check_ans_show_bool
\g__enumext_check_ans_show_h_bool
\g__enumext_check_ans_item_tl
\g__enumext_count_item_anskey_int
\g__enumext_count_item_number_int
```

Internal variables used by “check answer” mechanism (§10.22) controlled by the `check-ans` and `no-store` keys.

```
122 \bool_new:N \l__enumext_store_ans_bool
123 \bool_new:N \l__enumext_check_ans_bool
124 \bool_new:N \g__enumext_check_ans_show_bool
125 \bool_new:N \g__enumext_check_ans_show_h_bool
126 \tl_new:N \g__enumext_check_ans_item_tl
127 \int_new:N \g__enumext_count_item_anskey_int
128 \int_new:N \g__enumext_count_item_number_int
129 \int_new:N \g__enumext_standar_star_env_int
130 \int_new:N \g__enumext_starred_star_env_int
131 \int_new:N \g__enumext_starred_keyans_star_env_int
132 \int_new:N \g__enumext_standar_keyans_star_env_int
133 \int_new:N \g__enumext_standar_keyans_pic_star_env_int
```

(End of definition for `\l__enumext_store_ans_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 (§10.7). The boolean variable `\l__enumext_footnotes_key_bool` determine if `hyperref` is load with key `hyperfootnotes=true`.

```
134 \bool_new:N \l__enumext_hyperref_bool
135 \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_store_write_aux_file_tl
\l__enumext_label_copy_X_tl
```

Internal variables are used when executing the `save-ref` key. 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` and the variable `\l__enumext_store_write_aux_file_tl` will be in charge of executing the writing code in the `.aux` file.

```
136 \tl_new:N \l__enumext_newlabel_arg_one_tl
137 \tl_new:N \l__enumext_newlabel_arg_two_tl
```

```

138 \tl_new:N \l__enumext_store_write_aux_file_tl
139 \cs_set_protected:Npn \__enumext_tmp:n #1
140 {
141     \tl_new:c { l__enumext_label_copy_#1_tl }
142 }
143 \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`

Internal variables used for redefinition of `\footnote`.

`\g__enumext_footnote_arg_seq`
`\g__enumext_footnote_int_seq`

```

144 \int_new:N \g__enumext_footnote_int
145 \seq_new:N \g__enumext_footnote_arg_seq
146 \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`.)

`\c__enumext_counter_style_tl`
`\l__enumext_ref_key_arg_tl`
`\l__enumext_ref_aux_tl`
`\l__enumext_the_counter_X_tl`
`\l__enumext_counter_style_for_ref_X_tl`

Internal variables used by `ref` key (§10.17, §10.18).

```

147 \tl_const:Nn \c__enumext_counter_style_tl
148 { { arabic } { roman } { Roman } { alph } { Alph } }
149 \tl_new:N \l__enumext_ref_key_arg_tl
150 \tl_new:N \l__enumext_ref_aux_tl
151 \cs_set_protected:Npn \__enumext_tmp:n #1
152 {
153     \tl_new:c { l__enumext_counter_style_for_ref_#1_tl }
154     \tl_new:c { l__enumext_the_counter_#1_tl }
155     \tl_set:ce { l__enumext_the_counter_#1_tl } { \exp_not:c { theenumX#1 } }
156 }
157 \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.)

`\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_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`
`\g__enumext_miniright_code_X_tl`
`\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.

```

158 \cs_set_protected:Npn \__enumext_tmp:n #1
159 {
160     \bool_new:c { l__enumext_item_starred_#1_bool }
161     \int_new:c { l__enumext_item_column_pos_#1_int }
162     \int_new:c { g__enumext_item_count_all_#1_int }
163     \int_new:c { l__enumext_joined_item_#1_int }
164     \int_new:c { l__enumext_joined_item_aux_#1_int }
165     \int_new:c { l__enumext_tmpa_#1_int }
166     \box_new:c { l__enumext_item_text_#1_box }
167     \dim_new:c { l__enumext_joined_width_#1_dim }
168     \dim_new:c { l__enumext_item_width_#1_dim }
169     \tl_new:c { g__enumext_item_symbol_aux_#1_tl }
170     \str_new:c { l__enumext_align_label_#1_str }
171     \bool_new:c { g__enumext_minipage_active_#1_bool }
172     \tl_new:c { g__enumext_miniright_code_#1_tl }
173     \bool_new:c { g__enumext_minipage_center_#1_bool }
174     \dim_new:c { g__enumext_minipage_right_#1_dim }
175     \skip_new:c { g__enumext_minipage_right_#1_skip }
176 }
177 \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`.

```

178 \clist_const:Nn \c__enumext_all_envs_clist
179 {
180     {level-1}{i}, {level-2}{ii}, {level-3}{iii}, {level-4}{iv},
181     {keyans}{v}, {enumext*}{vii}, {keyans*}{viii}
182 }

```

(End of definition for `\c__enumext_all_envs_clist`.)

10.5 Some utility functions

`__enumext_at_begin_document:n`

A internal “hook” function used for copying plain `list` and `minipage` environments definition and `hyperref` detection.

```
183 \cs_new_protected:Npn \__enumext_at_begin_document:n #1
184 {
185   \hook_gput_code:nnn {begindocument} {enumext} { #1 }
186 }
```

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

`__enumext_after_env:nn`

A internal “hook” function for execute code `miniright` and `miniright*` keys outside the `enumext*` and `keyans*` environments and print `check-ans` outside the `enumext` and `enumext*` environments.

```
187 \cs_new_protected:Npn \__enumext_after_env:nn #1 #2
188 {
189   \hook_gput_code:nnn {env/#1/after} {enumext} {#2}
190 }
```

(End of definition for `__enumext_after_env:nn`.)

`__enumext_level:`

Function for check current level in `enumext`.

```
191 \cs_new:Nn \__enumext_level:
192 {
193   \int_to_roman:n { \__enumext_level_int }
194 }
```

(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?](#).

```
195 \prg_new_protected_conditional:Npnn \__enumext_if_is_int:n #1 { T, F, TF }
196 {
197   \regex_match:nnTF { ^[\+|-]?[\d]+$ } {#1} % $
198   { \prg_return_true: }
199   { \prg_return_false: }
200 }
```

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

`__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.

```
201 \cs_new:Npn \__enumext_show_length:nnn #1 #2 #3
202 {
203   * ~ #2
204   \prg_replicate:nn { 14 - \str_count:n {#2} } { ~ }
205   = ~ \use:c { #1_use:c } { \__enumext_#2_#3_#1 } \\
206 }
```

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

`__enumext_zero_count_level:`

Internal function used by `check-ans` key.

```
207 \cs_set_protected:Nn \__enumext_zero_count_level:
208 {
209   \cs_set_protected:Npn \__enumext_tmp:n ##1
210   {
211     \int_gzero:c { g__enumext_count_level_##1_int }
212   }
213   \clist_map_inline:nn { i, ii, iii, iv, vii } { \__enumext_tmp:n {##1} }
214 }
```

(End of definition for `__enumext_zero_count_level:.`)

`__enumext_current_env_set_bool:`

The function `__enumext_current_env_set_bool:` will set the global variables `\g__enumext_standar_bool` and `\g__enumext_starred_bool` with which we will distinguish whether the environments `enumext` and `enumext*` are nested in each other. This function is passed to the `__enumext_safe_exec:` function in the definition of the `enumext` environment (pag 74) and to the `__enumext_safe_exec_vii:` function in the definition of the `enumext*` environment (pag 87).

```
215 \cs_new_protected:Nn \__enumext_current_env_set_bool:
216 {
```

```

217 \str_case:en { \@currentvir }
218 {
219   {enumext}
220   {
221     \bool_lazy_and:nnT
222     { \bool_not_p:n { \g__enumext_standar_bool } }
223     { \int_compare_p:nNn { \l__enumext_level_h_int } = { \c_zero_int } }
224     {
225       \bool_gset_true:N \g__enumext_standar_bool
226       \int_gset:Nn \g__enumext_standar_star_env_int { \inputlineno }
227       \typeout{working-on-enumext}
228     }
229   }
230   {enumext*}
231   {
232     \bool_lazy_and:nnT
233     { \bool_not_p:n { \g__enumext_starred_bool } }
234     { \int_compare_p:nNn { \l__enumext_level_int } = { \c_zero_int } }
235     {
236       \bool_gset_true:N \g__enumext_starred_bool
237       \int_gset:Nn \g__enumext_starred_star_env_int { \inputlineno }
238       \typeout{working-on-enumext*}
239     }
240   }
241 }
242 }

```

(End of definition for `__enumext_current_env_set_bool:.`)

10.6 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.

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.

```

243 \__enumext_at_begin_document:n
244 {
245   \cs_new_eq:NN \__enumext_start_list:nn \list
246   \cs_new_eq:NN \__enumext_stop_list: \endlist
247   \cs_new_eq:NN \__enumext_item_std:w \item
248 }

```

(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.

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

```

249 \__enumext_at_begin_document:n
250 {
251   \cs_new_eq:NN \__enumext_minipage:w \minipage
252   \cs_new_eq:NN \__enumext_endminipage: \endminipage
253 }

```

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

10.7 Compatibility with hyperref and footnotehyper

First we define the necessary rules using “hooks” to determine if the `hyperref` package is loaded.

```
254 \hook_gput_code:nnn { begindocument } { enumext } { \__enumext_after_hyperref: }
255 \hook_gset_rule:nnnn { begindocument } { enumext } { after } { hyperref }
```

```
\__enumext_after_hyperref:
\__enumext_hypertarget:nn
\__enumext_phantomsection:
```

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”.

```
256 \cs_new_protected:Nn \__enumext_after_hyperref:
257 {
258   \IfPackageLoadedTF { hyperref }
259   {
260     \msg_info:nnn { enumext } { package-load } { hyperref }
261     \bool_set_true:N \l__enumext_hyperref_bool
262     \IfHyperBoolean{hyperfootnotes}
263     {
264       \typeout{hyperfootnotes=true}
265       \bool_set_true:N \l__enumext_footnotes_key_bool
266     }
267     { \typeout{hyperfootnotes=false} }
268   }
269   { }
```

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`.

```
270   \bool_if:NT \l__enumext_footnotes_key_bool
271   {
272     \IfPackageLoadedTF { footnotehyper }
273     {
274       \msg_info:nnn { enumext } { package-load } { footnotehyper }
275     }
276     {
277       \typeout{No ~ footnotehyper ~ load}
278       \typeout{Load ~ and ~ use ~ \string\makesavenoteenv{enumext*}}
279       \bool_set_false:N \l__enumext_footnotes_key_bool
280     }
281   }
```

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.

```
282   \bool_if:NTF \l__enumext_hyperref_bool
283   {
284     \cs_new_eq:NN \__enumext_hypertarget:nn \hypertarget
285     \cs_new_eq:NN \__enumext_phantomsection: \phantomsection
286   }
287   {
288     \cs_new_eq:NN \__enumext_hypertarget:nn \use_none:nn
289     \cs_new_eq:NN \__enumext_phantomsection: \prg_do_nothing:
290   }
291 }
```

(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.

```
292 \cs_new_protected:Npn \__enumext_newlabel:nn #1 #2
293 {
294   \protected@write \@auxout { }
295   {
296     \token_to_str:N \newlabel {#1}
```

```

297         {
298             {#2}
299             \bool_if:NT \l__enumext_hyperref_bool
300             { { \thepage } {#2} {#1} }
301             { }
302         }
303     }
304     \__enumext_hypertarget:nn {#1} { }
305     \__enumext_phantomsection:
306 }

```

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

10.8 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.

```

307 \cs_new_protected:Npn \__enumext_define_counters:Nn #1 #2
308 {
309     \cs_if_exist:cTF { c@ #2 }
310     { \msg_fatal:nnn { enumext } { counters } { #2 } }
311     {
312         \tl_set:Nn #1 { #2 }
313         \newcounter { #2 }
314     }
315 }

```

(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      316 \__enumext_define_counters:Nn \l__enumext_counter_i_tl { enumXi }
enumXii     317 \__enumext_define_counters:Nn \l__enumext_counter_ii_tl { enumXii }
enumXiii    318 \__enumext_define_counters:Nn \l__enumext_counter_iii_tl { enumXiii }
enumXiv     319 \__enumext_define_counters:Nn \l__enumext_counter_iv_tl { enumXiv }
enumXvii    320 \__enumext_define_counters:Nn \l__enumext_counter_v_tl { enumXv }
enumXviii   321 \__enumext_define_counters:Nn \l__enumext_counter_vi_tl { enumXvi }
            322 \__enumext_define_counters:Nn \l__enumext_counter_vii_tl { enumXvii }
            323 \__enumext_define_counters:Nn \l__enumext_counter_viii_tl { enumXviii }

```

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

10.9 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.

```

324 \cs_new_protected:Npn \__enumext_register_counter_style:Nn #1 #2
325 {
326     \tl_const:cn { c__enumext_widest_ \cs_to_str:N #1 _tl } {#2}
327     \tl_gput_right:Nn \g__enumext_counter_styles_tl {#1}
328 }
329 \__enumext_register_counter_style:Nn \arabic { 0 }
330 \__enumext_register_counter_style:Nn \Alph { M }
331 \__enumext_register_counter_style:Nn \alph { m }
332 \__enumext_register_counter_style:Nn \Roman { VIII }
333 \__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.

```

334 \cs_new_protected:Npn \__enumext_label_width_by_box:Nn #1 #2
335 {
336   \hbox_set:Nn \__enumext_label_width_by_box {#2}
337   \dim_set:Nn #1 { \box_wd:N \__enumext_label_width_by_box }
338 }
339 \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.

```

340 \cs_new_protected:Npn \__enumext_label_style:Nnn #1 #2 #3
341 {
342   \tl_clear_new:N #1
343   \tl_put_right:Ne #1 { \tl_trim_spaces:n {#3} }
344   \tl_gset_eq:NN \g__enumext_widest_label_tl #1
345   \tl_map_inline:Nn \g__enumext_counter_styles_tl
346   {
347     \tl_replace_all:Nne #1 { ##1* } { \exp_not:N ##1 {#2} }
348     \tl_greplace_all:Nne \g__enumext_widest_label_tl { ##1* }
349     { \tl_use:c { c__enumext_widest_ \cs_to_str:N ##1 _tl } }
350   }
351   \__enumext_label_width_by_box:Nn \__enumext_current_widest_dim
352   { \tl_use:N \g__enumext_widest_label_tl }
353   \tl_set_eq:cN { the #2 } #1
354 }
355 \cs_generate_variant:Nn \__enumext_label_style:Nnn { cvn }

```

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

10.10 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.

```

356 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
357 {
358   \keys_define:nn { enumext / #1 }
359   {
360     font      .tl_set:c   = { l__enumext_label_font_style_#2_tl },
361     font      .value_required:n = true,
362     labelsep  .dim_set:c   = { l__enumext_labelsep_#2_dim },
363     labelsep  .initial:n   = { 0.3333em },
364     labelsep  .value_required:n = true,
365     labelwidth .dim_set:c   = { l__enumext_labelwidth_#2_dim },
366     labelwidth .value_required:n = true,
367     wrap-label .cs_set_protected:cp = { __enumext_wrapper_label_#2:n } ##1,
368     wrap-label .initial:n   = { ##1 },
369     wrap-label .value_required:n = true,
370     wrap-label* .code:n = {
371       \bool_set_true:c { l__enumext_wrap_label_opt_#2_bool }
372       \keys_set:nn { enumext / #1 } { wrap-label = {##1} }
373     },
374     wrap-label* .value_required:n = true,
375   }
376 }
377 \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.

```

378 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
379 {

```

```

380 \keys_define:nn { enumext / #1 }
381 {
382   align .choice:,
383   align / left .code:n =
384     {
385       \tl_clear:c { l__enumext_label_fill_left_#2_tl }
386       \tl_set:cn { l__enumext_label_fill_right_#2_tl } { \hfill }
387     },
388   align / right .code:n =
389     {
390       \tl_set:cn { l__enumext_label_fill_left_#2_tl } { \hfill }
391       \tl_clear:c { l__enumext_label_fill_right_#2_tl }
392     },
393   align / center .code:n =
394     {
395       \tl_set:cn { l__enumext_label_fill_left_#2_tl } { \hfill }
396       \tl_set:cn { l__enumext_label_fill_right_#2_tl } { \hfill }
397     },
398   align .initial:n = left,
399   align .value_required:n = true,
400 }
401 }
402 \clist_map_inline:nn
403 {
404   {level-1}{i}, {level-2}{ii}, {level-3}{iii}, {level-4}{iv}, {keyans}{v}
405 }
406 { \__enumext_tmp:nn #1 }

```

Definition of `align` key for `enumext*` and `keyans*` environments.

```

407 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
408 {
409   \keys_define:nn { enumext / #1 }
410   {
411     align .choice:,
412     align / left .code:n = \str_set:cn { l__enumext_align_label_#2_str } { l },
413     align / right .code:n = \str_set:cn { l__enumext_align_label_#2_str } { r },
414     align / center .code:n = \str_set:cn { l__enumext_align_label_#2_str } { c },
415     align .initial:n = left,
416     align .value_required:n = true,
417   }
418 }
419 \clist_map_inline:nn { {enumext*}{vii}, {keyans*}{viii} } { \__enumext_tmp:nn #1 }

```

(End of definition for `align`.)

10.11 Setting label and ref keys

`__enumext_regex_label_ref_key:`

The internal function `__enumext_regex_label_ref_key:` replace the `*` with the actual counter of the running level and is used by the `__enumext_set_label_ref:n` function.

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.

```

420 \cs_new_protected:Nn \__enumext_regex_label_ref_key:
421 {
422   \tl_map_inline:Nn \c__enumext_counter_style_tl
423   {
424     \regex_replace_once:nnN { \c{##1}\* }
425     { \c{##1}\cB{\u{l__enumext_ref_aux_tl}\cE} } \l__enumext_ref_key_arg_tl
426   }
427 }

```

(End of definition for `__enumext_regex_label_ref_key:`.)

`__enumext_set_label_ref:n`

The `__enumext_set_label_ref:n` function controlled by the `ref` key is in charge of handling the customization of the reference system.

First we will set the variable `\l__enumext_the_counter_X_tl` according to the command created for *each counter*, apply the `regex` function `__enumext_regex_label_ref_key:` and then renew the command and save it in the variable `\l__enumext_counter_style_for_ref_X_tl`.

```

428 \cs_new_protected:Npn \__enumext_set_label_ref:n #1
429 {
430   \tl_set:Nn \l__enumext_ref_key_arg_tl {#1}

```



```

431 \tl_set_eq:Nc \l__enumext_ref_aux_tl { \l__enumext_counter_ \__enumext_level: _tl }
432 \__enumext_regex_label_ref_key:
433 \tl_set_eq:Nc \l__enumext_ref_aux_tl { \l__enumext_the_counter_ \__enumext_level: _tl }
434 \tl_put_right:ce { \l__enumext_counter_style_for_ref_ \__enumext_level: _tl }
435 {
436   \exp_not:N \renewcommand { \exp_not:V \l__enumext_ref_aux_tl }
437   { \exp_not:V \l__enumext_ref_key_arg_tl }
438 }
439 }

```

(End of definition for `__enumext_set_label_ref:n`.)

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

```

440 \cs_new_protected:Nn \__enumext_use_key_ref:
441 {
442   \tl_if_empty:cF { \l__enumext_counter_style_for_ref_ \__enumext_level: _tl }
443   {
444     \tl_use:c { \l__enumext_counter_style_for_ref_ \__enumext_level: _tl }
445   }
446 }

```

(End of definition for `__enumext_use_key_ref:`.)

For `enumext*` and `keyans*` environments the situation is a bit different since `hyperref` interferes here (I am not clear why), so we will define a new function to execute the task.

To handle that we will look at the nesting level of the starred environments, later I will run the constraint functions to make everything OK.

`__enumext_set_label_ref_h:n` The `__enumext_set_label_ref_h:n` function controlled by the `ref` key is in charge of handling the customization of the reference system.

First we will set the variable `\l__enumext_the_counter_X_tl` according to the command created for *each counter*, apply the `regex` function `__enumext_regex_label_ref_key:` and then renew the command and save it in the variable `\l__enumext_counter_style_for_ref_X_tl`.

```

447 \cs_new_protected:Npn \__enumext_set_label_ref_h:n #1
448 {
449   \tl_set:Nn \l__enumext_ref_key_arg_tl {#1}
450   \int_compare:nNnTF { \l__enumext_level_h_int } = { 1 }
451   {
452     \tl_set_eq:NN \l__enumext_ref_aux_tl \l__enumext_counter_vii_tl
453     \__enumext_regex_label_ref_key:
454     \tl_set_eq:NN \l__enumext_ref_aux_tl \l__enumext_the_counter_vii_tl
455     \tl_put_right:Ne \l__enumext_counter_style_for_ref_vii_tl
456     {
457       \exp_not:N \renewcommand { \exp_not:V \l__enumext_ref_aux_tl }
458       { \exp_not:V \l__enumext_ref_key_arg_tl }
459     }
460   }
461   {
462     \tl_set_eq:NN \l__enumext_ref_aux_tl \l__enumext_counter_viii_tl
463     \__enumext_regex_label_ref_key:
464     \tl_set_eq:NN \l__enumext_ref_aux_tl \l__enumext_the_counter_viii_tl
465     \tl_put_right:Ne \l__enumext_counter_style_for_ref_vii_tl
466     {
467       \exp_not:N \renewcommand { \exp_not:V \l__enumext_ref_aux_tl }
468       { \exp_not:V \l__enumext_ref_key_arg_tl }
469     }
470   }
471 }

```

(End of definition for `__enumext_set_label_ref_h:n`.)

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

```

472 \cs_new_protected:Nn \__enumext_use_key_ref_h:
473 {
474   \int_compare:nNnTF { \l__enumext_level_h_int } = { 1 }
475   {
476     \tl_if_empty:NF \l__enumext_counter_style_for_ref_vii_tl
477     {
478       \tl_use:N \l__enumext_counter_style_for_ref_vii_tl

```

```

479     }
480   }
481   {
482     \tl_if_empty:NF \__enumext_counter_style_for_ref_viii_tl
483     {
484       \tl_use:N \__enumext_counter_style_for_ref_viii_tl
485     }
486   }
487 }

```

(End of definition for `__enumext_use_key_ref_h:`.)

10.11.1 Define and set label key for enumext environment

Here we set the default `<labels>` of the four levels of `enumext` environment, along with the default value for `labelwidth` key.

```

\__enumext_label_i_tl 488 \cs_set_protected:Npn \__enumext_tmp:nnn #1 #2 #3
\__enumext_label_ii_tl 489 {
\__enumext_label_iii_tl 490   \keys_define:nn { enumext / #1 }
\__enumext_label_iv_tl 491   {
492     label .code:n = {
493       \__enumext_label_style:cvn { \__enumext_label_#2_tl }
494       { \__enumext_counter_#2_tl } {##1}
495       \dim_set_eq:cN { \__enumext_labelwidth_#2_dim }
496       \__enumext_current_widest_dim
497     },
498     label .initial:n = #3,
499     label .value_required:n = true,
500     ref .code:n = \__enumext_set_label_ref:n {##1},
501     ref .value_required:n = true,
502   }
503 }
504 \__enumext_tmp:nnn { level-1 } { i } { \arabic*. }
505 \__enumext_tmp:nnn { level-2 } { ii } { (\alph*) }
506 \__enumext_tmp:nnn { level-3 } { iii } { \roman*. }
507 \__enumext_tmp:nnn { level-4 } { iv } { \Alph*. }

```

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

10.11.2 Define and set label key for enumext* and keyans* environments

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

```

\__enumext_label_vii_tl 508 \cs_set_protected:Npn \__enumext_tmp:nnn #1 #2 #3
\__enumext_label_viii_tl 509 {
510   \keys_define:nn { enumext / #1 }
511   {
512     label .code:n = {
513       \__enumext_label_style:cvn { \__enumext_label_#2_tl }
514       { \__enumext_counter_#2_tl } {##1}
515       \dim_set_eq:cN { \__enumext_labelwidth_#2_dim }
516       \__enumext_current_widest_dim
517     },
518     label .initial:n = #3,
519     label .value_required:n = true,
520     ref .code:n = \__enumext_set_label_ref_h:n {##1},
521     ref .value_required:n = true,
522   }
523 }
524 \__enumext_tmp:nnn { enumext* } { vii } { \arabic*. }
525 \__enumext_tmp:nnn { keyans* } { viii } { (\Alph*) }

```

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

10.11.3 Define and set label key for keyans and keyanspic environment

Here we set the default `<label>` for `keyans` and `keyanspic` environment, along with the default value for `labelwidth`. The `keyanspic` environment use the same `<label>` as the `keyans` environment.

Define and set `label` key for `keyans` environment.

```

526 \keys_define:nn { enumext / keyans }
527 {
528   label .code:n = {
529     \__enumext_label_style:cvn { \__enumext_label_v_tl }
530     { \__enumext_counter_v_tl } {##1}

```

```

531         \dim_set_eq:cN { l__enumext_labelwidth_v_dim }
532         \l__enumext_current_widest_dim
533         \__enumext_label_style:cvn { l__enumext_label_vi_tl }
534         { l__enumext_counter_vi_tl } {#1}
535         \dim_set_eq:cN { l__enumext_labelwidth_v_dim }
536         \l__enumext_current_widest_dim
537     },
538     label .initial:n = (\Alpha*),
539     label .value_required:n = true,
540 }

```

(End of definition for `label`, `\l__enumext_label_v_tl`, and `\l__enumext_label_vi_tl`.)

10.12 Setting start and widest keys

The function `__enumext_start_from:NNn` used by the `start` key 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 `\Alpha`, `\alph`, `\Roman` or `\roman`. This effectively allows `start=A` or `start=1` to be used.

```

541 \cs_new_protected:Npn \__enumext_start_from:NNn #1 #2 #3
542 {
543     \__enumext_if_is_int:nTF { #3 }
544     {
545         \int_set:Nn #2 {#3}
546     }
547     {
548         \regex_match:nVT { \c{Alpha} | \c{alph} } {#1}
549         { \int_set:Nn #2 { \int_from_alph:n {#3} } }
550         \regex_match:nVT { \c{Roman} | \c{roman} } {#1}
551         { \int_set:Nn #2 { \int_from_roman:n {#3} } }
552     }
553 }
554 \cs_generate_variant:Nn \__enumext_start_from:NNn { ccn }

```

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

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 `\Alpha`, `\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.

```

555 \cs_new_protected:Npn \__enumext_widest_from:nNNn #1 #2 #3 #4
556 {
557     \__enumext_if_is_int:nTF {#4}
558     {
559         \setcounter{enumX#1} { #4 }
560     }
561     {
562         \regex_match:nVT { \c{Alpha} | \c{alph} } {#2}
563         { \setcounter{enumX#1} { \int_from_alph:n {#4} } }
564         \regex_match:nVT { \c{Roman} | \c{roman} } {#2}
565         { \setcounter{enumX#1} { \int_from_roman:n {#4} } }
566     }
567     \__enumext_label_width_by_box:cv
568     { l__enumext_labelwidth_#1_dim } { l__enumext_label_#1_tl }
569 }
570 \cs_generate_variant:Nn \__enumext_widest_from:nNNn { nccn }

```

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

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

```

571 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
572 {

```

```

573 \keys_define:nn { enumext / #1 }
574 {
575   start .code:n = {
576     \__enumext_start_from:ccn
577     { l__enumext_label_#2_tl }
578     { l__enumext_start_#2_int } {##1}
579   },
580   start .initial:n = 1,
581   widest .code:n = {
582     \__enumext_widest_from:nccn {#2}
583     { l__enumext_label_#2_tl }
584     { l__enumext_labelwidth_#2_dim } {##1}
585   },
586   widest .value_required:n = true,
587   start .value_required:n = true,
588 }
589 }
590 \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }

```

(End of definition for start, widest, and \l__enumext_start_X_int.)

10.13 Setting keys for vertical spaces

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

```

topsep 591 \cs_set_protected:Npn \__enumext_tmp:nnnnnn #1 #2 #3 #4 #5 #6
partopsep 592 {
parsep 593 \keys_define:nn { enumext / #1 }
noitemsep 594 {
nosep 595   topsep .skip_set:c = { l__enumext_topsep_#2_skip },
596   topsep .initial:n = {#3},
597   topsep .value_required:n = true,
598   partopsep .skip_set:c = { l__enumext_partopsep_#2_skip },
599   partopsep .initial:n = {#4},
600   partopsep .value_required:n = true,
601   parsep .skip_set:c = { l__enumext_parsep_#2_skip },
602   parsep .initial:n = {#5},
603   parsep .value_required:n = true,
604   itemsep .skip_set:c = { l__enumext_itemsep_#2_skip },
605   itemsep .initial:n = {#6},
606   itemsep .value_required:n = true,
607   noitemsep .meta:n = { itemsep = 0pt, parsep = 0pt },
608   noitemsep .value_forbidden:n = true,
609   nosep .meta:n = {
610     itemsep = 0pt, parsep = 0pt,
611     topsep = 0pt, partopsep = 0pt,
612   },
613   nosep .value_forbidden:n = true,
614 }
615 }

```

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

```

616 \__enumext_tmp:nnnnnn { level-1 } { i } { 8.0pt plus 2.0pt minus 4.0pt }
617 { 2.0pt plus 1.0pt minus 1.0pt } { 4.0pt plus 2.0pt minus 1.0pt }
618 { 4.0pt plus 2.0pt minus 1.0pt }
619 \__enumext_tmp:nnnnnn { level-2 } { ii } { 4.0pt plus 2.0pt minus 1.0pt }
620 { 2.0pt plus 1.0pt minus 1.0pt } { 2.0pt plus 1.0pt minus 1.0pt }
621 { 2.0pt plus 1.0pt minus 1.0pt }
622 \__enumext_tmp:nnnnnn { level-3 } { iii } { 2.0pt plus 1.0pt minus 1.0pt }
623 { 1.0pt minus 1.0pt } { 0pt } { 2.0pt plus 1.0pt minus 1.0pt }
624 \__enumext_tmp:nnnnnn { level-4 } { iv } { 2.0pt plus 1.0pt minus 1.0pt }
625 { 1.0pt minus 1.0pt } { 0pt } { 2.0pt plus 1.0pt minus 1.0pt }
626 \__enumext_tmp:nnnnnn { keyans } { v } { 4.0pt plus 2.0pt minus 1.0pt }
627 { 2.0pt plus 1.0pt minus 1.0pt } { 2.0pt plus 1.0pt minus 1.0pt }
628 { 2.0pt plus 1.0pt minus 1.0pt }
629 \__enumext_tmp:nnnnnn { enumext* } { vii } { 8.0pt plus 2.0pt minus 4.0pt }
630 { 2.0pt plus 1.0pt minus 1.0pt } { 4.0pt plus 2.0pt minus 1.0pt }
631 { 4.0pt plus 2.0pt minus 1.0pt }
632 \__enumext_tmp:nnnnnn { keyans* } { viii } { 4.0pt plus 2.0pt minus 1.0pt }
633 { 2.0pt plus 1.0pt minus 1.0pt } { 2.0pt plus 1.0pt minus 1.0pt }
634 { 2.0pt plus 1.0pt minus 1.0pt }

```

(End of definition for topsep and others.)

10.14 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` and `keyans` environments.

```

635 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
636 {
637   \keys_define:nn { enumext / #1 }
638   {
639     itemindent .dim_set:c = { l__enumext_fake_item_indent_#2_dim },
640     itemindent .value_required:n = true,
641     rightmargin .dim_set:c = { l__enumext_rightmargin_#2_dim },
642     rightmargin .value_required:n = true,
643     listparindent .dim_set:c = { l__enumext_listparindent_#2_dim },
644     listparindent .value_required:n = true,
645     list-offset .dim_set:c = { l__enumext_listoffset_#2_dim },
646     list-offset .value_required:n = true,
647     list-indent .code:n =
648       \bool_set_true:c { l__enumext_leftmargin_tmp_#2_bool }
649       \dim_set:cn { l__enumext_leftmargin_tmp_#2_dim } {##1},
650     list-indent .value_required:n = true,
651   }
652 }
653 \clist_map_inline:Nn \__enumext_all_envs_clist { \__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.

```

654 \cs_set_protected:Npn \__enumext_tmp:n #1
655 {
656   \keys_define:nn { enumext / #1 } { list-indent .initial:n = 0pt, }
657 }
658 \clist_map_inline:nn { enumext*, keyans* } { \__enumext_tmp:n {##1} }

```

10.14.1 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.

```

659 \cs_set_protected:Nn \__enumext_fake_item:
660 {
661   \dim_compare:nNnT
662     { \dim_use:c { l__enumext_fake_item_indent_ \__enumext_level: _dim } }
663     >
664     { \c_zero_dim }
665   {
666     \tl_set:ce { l__enumext_fake_item_indent_ \__enumext_level: _tl }
667     {
668       \exp_not:N \mode_leave_vertical:
669       \exp_not:n { \skip_horizontal:n }
670       { \dim_use:c { l__enumext_fake_item_indent_ \__enumext_level: _dim } } }
671     \ignorespaces
672   }
673 }
674 }
675 \cs_set_protected:Nn \__enumext_keyans_fake_item:
676 {
677   \dim_compare:nNnT
678     { \l__enumext_fake_item_indent_v_dim } > { \c_zero_dim }
679   {
680     \tl_set:Ne \l__enumext_fake_item_indent_v_tl
681     {
682       \exp_not:N \mode_leave_vertical:
683       \exp_not:N \skip_horizontal:N \l__enumext_fake_item_indent_v_dim
684     }
685   }
686 }
687 \cs_set_protected:Nn \__enumext_fake_item_vii:
688 {
689   \dim_compare:nNnT
690     { \l__enumext_fake_item_indent_vii_dim } > { \c_zero_dim }

```

```

691     {
692         \tl_set:Nc \__enumext_fake_item_indent_vii_tl
693         {
694             \exp_not:N \mode_leave_vertical:
695             \exp_not:N \skip_horizontal:N \__enumext_fake_item_indent_vii_dim
696         }
697     }
698 }
699 \cs_set_protected:Nn \__enumext_fake_item_viii:
700 {
701     \dim_compare:nNt
702     { \__enumext_fake_item_indent_viii_dim } > { \c_zero_dim }
703     {
704         \tl_set:Nc \__enumext_fake_item_indent_viii_tl
705         {
706             \exp_not:N \mode_leave_vertical:
707             \exp_not:N \skip_horizontal:N \__enumext_fake_item_indent_viii_dim
708         }
709     }
710 }

```

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

10.15 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 `__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.

```

711 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
712 {
713     \keys_define:nn { enumext / #1 }
714     {
715         show-length .bool_set:c = { \__enumext_show_length_#2_bool },
716         show-length .initial:n = false,
717     }
718 }
719 \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }

```

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

10.16 Setting before, after and first keys

`before` Define and set `before`, `before*`, `after` and `first` keys for `enumext` and `keyans` environments.

```

before*
after
first
720 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
721 {
722     \keys_define:nn { enumext / #1 }
723     {
724         before .tl_set:c = { \__enumext_before_no_starred_key_#2_tl },
725         before .value_required:n = true,
726         before* .tl_set:c = { \__enumext_before_starred_key_#2_tl },
727         before* .value_required:n = true,
728         after .tl_set:c = { \__enumext_after_stop_list_#2_tl },
729         after .value_required:n = true,
730         first .tl_set:c = { \__enumext_after_list_args_#2_tl },
731         first .value_required:n = true,
732     }
733 }
734 \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }

```

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

10.16.1 Functions for before, after and first keys in enumext

`__enumext_before_args_exec:` 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 *second argument* of the list.

```

\__enumext_before_keys_exec:
\__enumext_after_stop_list:
\__enumext_after_args_exec:
735 \cs_new_protected:Nn \__enumext_before_args_exec:
736 {
737     \tl_use:c { \__enumext_before_starred_key_ \__enumext_level: _tl }
738 }

```

The function `__enumext_before_keys_exec`: executes the $\{\langle code \rangle\}$ set by the `before` key “before” the `enumext` environment is started in *second argument* of the list. The $\{\langle code \rangle\}$ is executed “knowing” all definition and values provides by $\langle keys \rangle$.

```
739 \cs_new_protected:Nn \__enumext_before_keys_exec:
740 {
741     \tl_use:c { l__enumext_before_no_starred_key_ \__enumext_level: _tl }
742 }
```

The function `__enumext_after_stop_list`: executes the $\{\langle code \rangle\}$ set by the `after` key “after” the `enumext` environment has finished.

```
743 \cs_new_protected:Nn \__enumext_after_stop_list:
744 {
745     \tl_use:c { l__enumext_after_stop_list_ \__enumext_level: _tl }
746 }
```

The function `__enumext_after_args_exec`: executes the $\{\langle code \rangle\}$ 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`.

```
747 \cs_new_protected:Nn \__enumext_after_args_exec:
748 {
749     \tl_use:c { l__enumext_after_list_args_ \__enumext_level: _tl }
750 }
```

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

10.16.2 Functions for before, after and first keys in keyans

`__enumext_before_args_exec_v`: The function `__enumext_before_args_exec_v`: executes the $\{\langle code \rangle\}$ set by the `before*` key “before” the `keyans` environment is started. The $\{\langle code \rangle\}$ is executed “without” knowing any definition of the $\{\langle arg two \rangle\}$ of the list.

```
\__enumext_before_keys_exec_v:
\__enumext_after_stop_list_v:
\__enumext_after_args_exec_v:
751 \cs_new_protected:Nn \__enumext_before_args_exec_v:
752 {
753     \tl_use:N \l__enumext_before_starred_key_v_tl
754 }
```

The function `__enumext_before_keys_exec_v`: executes the $\{\langle code \rangle\}$ set by the `before` key “before” the `keyans` environment is started in $\{\langle arg two \rangle\}$ of the list. The $\{\langle code \rangle\}$ is executed “knowing” all definition and values provides by $\langle keys \rangle$.

```
755 \cs_new_protected:Nn \__enumext_before_keys_exec_v:
756 {
757     \tl_use:N \l__enumext_before_no_starred_key_v_tl
758 }
```

The function `__enumext_after_stop_list_v`: executes the $\{\langle code \rangle\}$ set by the `after` key “after” the `keyans` environment has finished.

```
759 \cs_new_protected:Nn \__enumext_after_stop_list_v:
760 {
761     \tl_use:N \l__enumext_after_stop_list_v_tl
762 }
```

The function `__enumext_after_args_exec_v`: executes the $\{\langle code \rangle\}$ set by the `first` key after the end of $\{\langle arg two \rangle\}$ of the list defining the `keyans` environment, just before the first occurrence of `\item`.

```
763 \cs_new_protected:Nn \__enumext_after_args_exec_v:
764 {
765     \tl_use:N \l__enumext_after_list_args_v_tl
766 }
```

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

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

`__enumext_before_args_exec_vii`: The function `__enumext_before_args_exec_v`: executes the $\{\langle code \rangle\}$ set by the `before*` key “before” the `keyans` environment is started. The $\{\langle code \rangle\}$ is executed “without” knowing any definition of the $\{\langle arg two \rangle\}$ of the list.

```
\__enumext_before_keys_exec_vii:
\__enumext_after_stop_list_vii:
\__enumext_after_args_exec_vii:
767 \cs_new_protected:Nn \__enumext_before_args_exec_vii:
768 {
769     \tl_use:N \l__enumext_before_starred_key_vii_tl
770 }
771 \cs_new_protected:Nn \__enumext_before_args_exec_viii:
772 {
773     \tl_use:N \l__enumext_before_starred_key_viii_tl
774 }
```


The functions `__enumext_before_keys_exec_vii:` and `__enumext_before_keys_exec_viii:` executes the `{\code}` set by the `before` key “before” in `enumext*` and `keyans*` environments is started in `{\arg two}` of the list. The `{\code}` is executed “knowing” all definition and values provides by `\keys`.

```

775 \cs_new_protected:Nn \__enumext_before_keys_exec_vii:
776 {
777   \tl_use:N \l__enumext_before_no_starred_key_vii_tl
778 }
779 \cs_new_protected:Nn \__enumext_before_keys_exec_viii:
780 {
781   \tl_use:N \l__enumext_before_no_starred_key_viii_tl
782 }

```

The function `__enumext_after_stop_list:` executes the `{\code}` set by the `after` key “after” the `keyans` environment has finished.

```

783 \cs_new_protected:Nn \__enumext_after_stop_list_vii:
784 {
785   \tl_use:N \l__enumext_after_stop_list_vii_tl
786 }
787 \cs_new_protected:Nn \__enumext_after_stop_list_viii:
788 {
789   \tl_use:N \l__enumext_after_stop_list_viii_tl
790 }

```

The function `__enumext_after_args_exec_v:` executes the `{\code}` set by the `first` key after the end of `{\arg two}` of the list defining the `keyans` environment, just before the first occurrence of `\item`.

```

791 \cs_new_protected:Nn \__enumext_after_args_exec_vii:
792 {
793   \tl_use:N \l__enumext_after_list_args_vii_tl
794 }
795 \cs_new_protected:Nn \__enumext_after_args_exec_viii:
796 {
797   \tl_use:N \l__enumext_after_list_args_viii_tl
798 }

```

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

10.17 Setting keys for multicol and minipage

`mini-env` 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.
`mini-sep` Define and set `mini-env`, `mini-sep`, `columns-sep` and `columns` keys for `enumext` and `keyans` environments.
`columns-sep`
`columns`

```

799 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
800 {
801   \keys_define:nn { enumext / #1 }
802   {
803     mini-env .dim_set:c = { l__enumext_minipage_right_#2_dim },
804     mini-env .value_required:n = true,
805     mini-sep .dim_set:c = { l__enumext_minipage_hsep_#2_dim },
806     mini-sep .initial:n = 0.3333em,
807     mini-sep .value_required:n = true,
808     columns-sep .dim_set:c = { l__enumext_columns_sep_#2_dim },
809     columns-sep .value_required:n = true,
810     columns .int_set:c = { l__enumext_columns_#2_int },
811     columns .initial:n = 1,
812     columns .value_required:n = true,
813   }
814 }
815 \clist_map_inline:Nn \__enumext_all_envs_clist { \__enumext_tmp:nn #1 }

```

For `enumext*` and `keyans*` environments the situation is a bit different, the default value for `columns` key are 2 and the command `\miniright` is not available, so we will add the keys `miniright` and `miniright*` to implement support for `minipage`.

```

816 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
817 {
818   \keys_define:nn { enumext / #1 }
819   {
820     columns .initial:n = 2,
821     miniright .tl_gset:c = { g__enumext_miniright_code_#2_tl },
822     miniright .value_required:n = true,
823     miniright* .code:n = {

```

```

824         \bool_gset_true:c { g__enumext_minipage_center_#2_bool }
825         \keys_set:nn { enumext / #1 } { miniright = {##1} }
826     },
827     miniright* .value_required:n = true,
828 }
829 }
830 \clist_map_inline:nn { {enumext*}{vii}, {keyans*}{viii} } { \__enumext_tmp:nn #1 }

```

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

10.18 Adjustment of vertical spaces for multicol

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

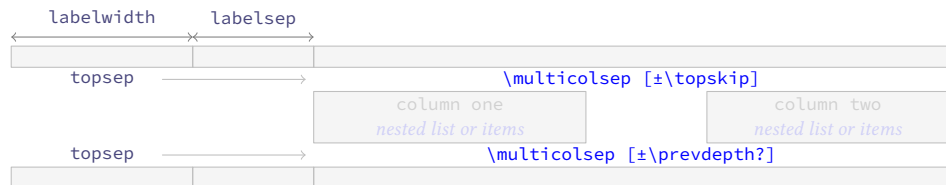


Figure 7: Representation of the vertical space in `multicol` for a nested level.

To keep the desired spaces *above* and *below* in the “*list environment*” (`\topsep` + `[\partopsep]`) it is necessary to “*adjust*” the spaces added by the `multicol` environment. The most appropriate option in this case is to use a “*context sensitive*” vertical space with `\addvspace`.

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.

10.18.1 Adjustment of vertical spaces for multicol 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 `multicol` 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_multicol_above_X_skip` and `\l__enumext_multicol_below_X_skip` equal to the value of `\topsep` in the *current level*.

```

831 \cs_new_protected:Nn \__enumext_multi_set_vskip:
832 {
833     \skip_set:cn { l__enumext_multicol_above_ \__enumext_level: _skip }
834     {
835         \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip }
836     }
837     \skip_set:cn { l__enumext_multicol_below_ \__enumext_level: _skip }
838     {
839         \skip_use:c { l__enumext_topsep_ \__enumext_level: _skip }
840     }
841     \__enumext_add_pre_parsep:
842 }

```

(End of definition for `__enumext_multi_set_vskip:`)

`__enumext_add_pre_parsep:` The function `__enumext_add_pre_parsep:` “*adjusted*” the value of `\l__enumext_multicol_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*.

```

843 \cs_new_protected:Nn \__enumext_add_pre_parsep:
844 {
845     \int_case:nn { \l__enumext_level_int }
846     {
847         { 2 }{
848             \skip_if_eq:nnF { \l__enumext_parsep_i_skip } { \c_zero_skip }
849             {
850                 \skip_add:Nn \l__enumext_multicol_above_ii_skip { \l__enumext_parsep_i_skip }
851             }
852         }
853         { 3 }{
854             \skip_if_eq:nnF { \l__enumext_parsep_ii_skip } { \c_zero_skip }
855             {

```

```

856             \skip_add:Nn \l__enumext_multicols_above_iii_skip { \l__enumext_parsep_iii_skip
857         }
858     }
859     { 4 }{
860         \skip_if_eq:nnF { \l__enumext_parsep_iii_skip } { \c_zero_skip }
861         {
862             \skip_add:Nn \l__enumext_multicols_above_iv_skip { \l__enumext_parsep_iii_skip
863         }
864     }
865 }
866 }

```

(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*.

```

867 \cs_new_protected:Nn \__enumext_multi_addvspace:
868 {
869     \__enumext_multi_set_vskip:
870     \mode_if_vertical:T
871     {
872         \skip_add:cn { \l__enumext_multicols_above_ \__enumext_level: _skip }
873         {
874             \skip_use:c { \l__enumext_partopsep_ \__enumext_level: _skip }
875         }
876         \skip_add:cn { \l__enumext_multicols_below_ \__enumext_level: _skip }
877         {
878             \skip_use:c { \l__enumext_partopsep_ \__enumext_level: _skip }
879         }
880     }
881     \par\nopagebreak
882     \addvspace{ \skip_use:c { \l__enumext_multicols_above_ \__enumext_level: _skip } }
883 }

```

(End of definition for `__enumext_multi_addvspace:`)

10.18.2 Adjustment of vertical spaces for multicols in keyans

`__enumext_keyans_multi_set_vskip:` 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`.

`__enumext_keyans_multi_addvspace:`

```

884 \cs_new_protected:Nn \__enumext_keyans_multi_set_vskip:
885 {
886     \skip_set:Nn \l__enumext_multicols_above_v_skip
887     {
888         \l__enumext_topsep_v_skip
889     }
890     \skip_set:Nn \l__enumext_multicols_below_v_skip
891     {
892         \l__enumext_topsep_v_skip
893     }
894 }
895 \cs_new_protected:Nn \__enumext_keyans_multi_addvspace:
896 {
897     \__enumext_keyans_multi_set_vskip:
898     \mode_if_vertical:T
899     {
900         \skip_add:Nn \l__enumext_multicols_above_v_skip
901         {
902             \skip_use:N \l__enumext_partopsep_v_skip
903         }
904         \skip_add:Nn \l__enumext_multicols_below_v_skip
905         {
906             \skip_use:N \l__enumext_partopsep_v_skip
907         }
908     }
909     \par\nopagebreak
910     \addvspace{ \l__enumext_multicols_above_v_skip }
911 }

```

(End of definition for `__enumext_keyans_multi_set_vskip:` and `__enumext_keyans_multi_addvspace:`)

10.19 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.

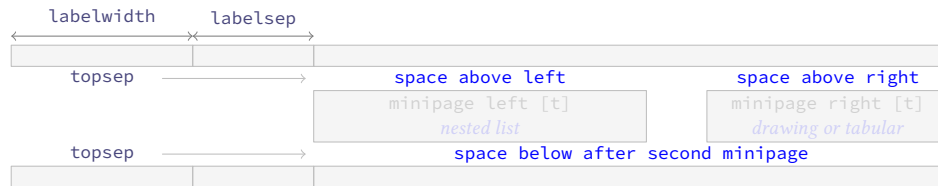


Figure 8: Representation of the `minipage` spacing adjustment for a nested level.

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`[12] package, again my attempts to find the correct values using `\showoutput` and `\showboxdepth` absolutely failed.

`__enumext_mini_env*` Creates a `__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 `\vspace{0pt}` to maintain alignment on “top”. 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.

```

912 \DeclareDocumentEnvironment{__enumext_mini_env*}{ m }
913 {
914     \__enumext_minipage:w [ t ] { #1 }
915     \legacy_if_gset_false:n { @minipage }
916     \vspace { 0pt }
917 }
918 { \__enumext_endminipage: }
```

(End of definition for `__enumext_mini_env*`.)

10.19.1 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`.

```

919 \cs_new_protected:Nn \__enumext_mini_set_vskip:
920 {
921     \int_compare:nNnTF
922     { \int_use:c { \l__enumext_columns_ \__enumext_level: _int } } > { 1 }
923     {
```

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.

```

924     \skip_if_eq:nnTF
925     { \skip_use:c { \l__enumext_topsep_ \__enumext_level: _skip } } { \c_zero_skip }
926     {
927         \skip_set:Nn \l__enumext_minipage_left_skip
928         {
929             -0.150\box_dp:N \strutbox
930         }
931         \skip_set:Nn \l__enumext_minipage_right_skip
932         {
933             0.695\box_dp:N \strutbox
934         }
935     }
```

```

935     \skip_set:Nn \l__enumext_minipage_after_skip
936     {
937         \box_dp:N \strutbox
938     }
939     \__enumext_zero_parsep:
940 }
941 {
942     \skip_set:Nn \l__enumext_minipage_left_skip
943     {
944         \skip_use:c { \l__enumext_topsep_ \__enumext_level: _skip }
945     }
946     \skip_set:Nn \l__enumext_minipage_right_skip
947     {
948         0.695\box_dp:N \strutbox
949     }
950     \skip_set:Nn \l__enumext_minipage_after_skip
951     {
952         1.85\box_dp:N \strutbox
953         + \skip_use:c { \l__enumext_topsep_ \__enumext_level: _skip }
954     }
955 }
956 }
957 {

```

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.

```

958     \skip_if_eq:nnTF
959     { \skip_use:c { \l__enumext_topsep_ \__enumext_level: _skip } } { \c_zero_skip }
960     {
961         \skip_set:Nn \l__enumext_minipage_left_skip
962         {
963             0.5\box_dp:N \strutbox
964             - \skip_use:c { \l__enumext_partopsep_ \__enumext_level: _skip }
965         }
966         \skip_set:Nn \l__enumext_minipage_right_skip
967         {
968             \skip_use:c { \l__enumext_partopsep_ \__enumext_level: _skip }
969         }
970         \skip_set:Nn \l__enumext_minipage_after_skip
971         {
972             1.6\box_dp:N \strutbox
973         }
974     }
975     {
976         \skip_set:Nn \l__enumext_minipage_left_skip
977         {
978             0.5875\box_dp:N \strutbox
979             - \skip_use:c { \l__enumext_partopsep_ \__enumext_level: _skip }
980         }
981         \skip_set:Nn \l__enumext_minipage_right_skip
982         {
983             + \skip_use:c { \l__enumext_topsep_ \__enumext_level: _skip }
984             + \skip_use:c { \l__enumext_partopsep_ \__enumext_level: _skip }
985         }
986         \skip_set:Nn \l__enumext_minipage_after_skip
987         {
988             0.325\box_dp:N \strutbox
989             + \skip_use:c { \l__enumext_topsep_ \__enumext_level: _skip }
990         }
991     }
992 }
993 }

```

(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.

```

994 \cs_new_protected:Nn \__enumext_zero_parsep:
995 {

```

```

996 \int_case:nn { \l__enumext_level_int }
997 {
998   { 2 }{
999     \skip_if_eq:nnF { \l__enumext_parsep_i_skip } { \c_zero_skip }
1000     {
1001       \skip_add:Nn \l__enumext_minipage_after_skip { 2.15\box_dp:N \strutbox }
1002     }
1003   }
1004   { 3 }{
1005     \skip_if_eq:nnF { \l__enumext_parsep_ii_skip } { \c_zero_skip }
1006     {
1007       \skip_add:Nn \l__enumext_minipage_after_skip { 2.15\box_dp:N \strutbox }
1008     }
1009   }
1010   { 4 }{
1011     \skip_if_eq:nnF { \l__enumext_parsep_iii_skip } { \c_zero_skip }
1012     {
1013       \skip_add:Nn \l__enumext_minipage_after_skip { 2.15\box_dp:N \strutbox }
1014     }
1015   }
1016 }
1017 }

```

(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*.

```

1018 \cs_new_protected:Nn \__enumext_mini_addvspace:
1019 {
1020   \__enumext_mini_set_vskip:
1021   \mode_if_vertical:T
1022   {
1023     \skip_add:Nn \l__enumext_minipage_left_skip
1024     {
1025       \skip_use:c { \l__enumext_partopsep_ \l__enumext_level: _skip }
1026     }
1027     \skip_add:Nn \l__enumext_minipage_after_skip
1028     {
1029       \skip_use:c { \l__enumext_partopsep_ \l__enumext_level: _skip }
1030     }
1031   }
1032   \par\nopagebreak
1033   \addvspace { \l__enumext_minipage_left_skip }
1034 }

```

(End of definition for `__enumext_mini_addvspace:`)

10.19.2 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`.

```

1035 \cs_new_protected:Nn \__enumext_keyans_mini_set_vskip:
1036 {
1037   \skip_zero_new:N \l__enumext_minipage_after_skip
1038   \skip_zero_new:N \l__enumext_minipage_left_skip
1039   \skip_zero_new:N \l__enumext_minipage_right_skip
1040   \int_compare:nNnTF { \l__enumext_columns_v_int } > { 1 }
1041   {
1042     \skip_if_eq:nnTF { \l__enumext_topsep_v_skip } { \c_zero_skip }
1043     {
1044       \skip_set:Nn \l__enumext_minipage_left_skip { -0.25\box_dp:N \strutbox }
1045       \skip_set:Nn \l__enumext_minipage_right_skip { 0.705\box_dp:N \strutbox }
1046       \skip_set:Nn \l__enumext_minipage_after_skip { \box_dp:N \strutbox }
1047       \skip_if_eq:nnF { \l__enumext_parsep_i_skip } { \c_zero_skip }
1048       {
1049         \skip_add:Nn \l__enumext_minipage_after_skip { 2.15\box_dp:N \strutbox }
1050       }
1051     }
1052   }

```

```

1052     {
1053         \skip_set:Nn \l__enumext_minipage_left_skip
1054         {
1055             \skip_use:N \l__enumext_topsep_v_skip
1056         }
1057         \skip_set:Nn \l__enumext_minipage_right_skip
1058         {
1059             0.705\box_dp:N \strutbox
1060         }
1061         \skip_set:Nn \l__enumext_minipage_after_skip
1062         {
1063             1.85\box_dp:N \strutbox + \l__enumext_topsep_v_skip
1064         }
1065     }
1066 }
1067 {
1068     \skip_if_eq:nnTF { \l__enumext_topsep_v_skip } { \c_zero_skip }
1069     {
1070         \skip_set:Nn \l__enumext_minipage_left_skip
1071         {
1072             0.5\box_dp:N \strutbox
1073             + \l__enumext_partopsep_v_skip
1074         }
1075         \skip_set:Nn \l__enumext_minipage_right_skip
1076         {
1077             \l__enumext_partopsep_v_skip
1078         }
1079         \skip_set:Nn \l__enumext_minipage_after_skip { 1.6\box_dp:N \strutbox }
1080     }
1081     {
1082         \skip_set:Nn \l__enumext_minipage_left_skip
1083         {
1084             0.5875\box_dp:N \strutbox - \l__enumext_partopsep_v_skip
1085         }
1086         \skip_set:Nn \l__enumext_minipage_right_skip
1087         {
1088             \l__enumext_topsep_v_skip + \l__enumext_partopsep_v_skip
1089         }
1090         \skip_set:Nn \l__enumext_minipage_after_skip
1091         {
1092             0.325\box_dp:N \strutbox + \l__enumext_topsep_v_skip
1093         }
1094     }
1095 }
1096 }

```

(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 $\langle\textit{horizontal mode}\rangle$ or $\langle\textit{vertical mode}\rangle$. 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`.

```

1097 \cs_new_protected:Nn \__enumext_keyans_mini_addvspace:
1098 {
1099     \__enumext_keyans_mini_set_vskip:
1100     \mode_if_vertical:T
1101     {
1102         \skip_add:Nn \l__enumext_minipage_left_skip
1103         {
1104             \l__enumext_partopsep_v_skip
1105         }
1106         \skip_add:Nn \l__enumext_minipage_after_skip
1107         {
1108             \l__enumext_partopsep_v_skip
1109         }
1110     }
1111     \par\nopagebreak
1112     \addvspace { \l__enumext_minipage_left_skip }
1113 }

```

(End of definition for `__enumext_keyans_mini_addvspace:`)

10.19.3 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*`.

```

1114 \cs_new_protected:Nn \__enumext_mini_set_vskip_vii:
1115 {
1116   \skip_zero_new:N \l__enumext_minipage_left_skip
1117   \skip_gzero_new:N \g__enumext_minipage_right_skip
1118   \skip_gzero_new:N \g__enumext_minipage_after_skip
1119   \skip_if_eq:nnTF { \l__enumext_topsep_vii_skip } { \c_zero_skip }
1120   {
1121     \skip_set:Nn \l__enumext_minipage_left_skip { 0.5\box_dp:N \strutbox }
1122     \skip_gset:Nn \g__enumext_minipage_right_skip { 0.325\box_dp:N \strutbox }
1123   }
1124   {
1125     \skip_set:Nn \l__enumext_minipage_left_skip { 0.5875\box_dp:N \strutbox }
1126     \skip_gset:Nn \g__enumext_minipage_right_skip
1127     {
1128       \l__enumext_topsep_vii_skip
1129     }
1130     \skip_gset:Nn \g__enumext_minipage_after_skip
1131     {
1132       0.325\box_dp:N \strutbox + \l__enumext_topsep_vii_skip
1133     }
1134   }
1135 }
1136 \cs_new_protected:Nn \__enumext_mini_set_vskip_viii:
1137 {
1138   \skip_zero_new:N \l__enumext_minipage_after_skip
1139   \skip_zero_new:N \l__enumext_minipage_left_skip
1140   \skip_zero_new:N \l__enumext_minipage_right_skip
1141   \skip_if_eq:nnTF { \l__enumext_topsep_viii_skip } { \c_zero_skip }
1142   {
1143     \skip_set:Nn \l__enumext_minipage_left_skip
1144     {
1145       0.5\box_dp:N \strutbox
1146     }
1147     \skip_set:Nn \l__enumext_minipage_right_skip
1148     {
1149       \l__enumext_partopsep_viii_skip
1150     }
1151     \skip_set:Nn \l__enumext_minipage_after_skip
1152     {
1153       1.6\box_dp:N \strutbox
1154     }
1155   }
1156   {
1157     \skip_set:Nn \l__enumext_minipage_left_skip
1158     {
1159       0.5875\box_dp:N \strutbox
1160     }
1161     \skip_set:Nn \l__enumext_minipage_right_skip
1162     {
1163       \l__enumext_topsep_viii_skip
1164     }
1165     \skip_set:Nn \l__enumext_minipage_after_skip
1166     {
1167       0.325\box_dp:N \strutbox + \l__enumext_topsep_viii_skip
1168     }
1169   }
1170 }

```

(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 `miniright` key is active in the `enumext*` and `keyans*` environments.

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

```

1171 \cs_new_protected:Nn \__enumext_mini_addvspace_vii:

```

```

1172 {
1173   \__enumext_mini_set_vskip_vii:
1174   \par\nopagebreak
1175   \addvspace { \__enumext_minipage_left_skip }
1176 }
1177 \cs_new_protected:Nn \__enumext_mini_addvspace_viii:
1178 {
1179   \__enumext_mini_set_vskip_viii:
1180   \par\nopagebreak
1181   \addvspace { \__enumext_minipage_left_skip }
1182 }

```

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

10.19.4 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 version ‘*’ inhibits the use of `\centering` command i.e. the usual L^AT_EX 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 from being executed inside the `keyanspic` environment, then we call the internal functions for the `enumext` and `keyans` environments.

```

1183 \NewDocumentCommand \miniright { s }
1184 {
1185   \int_compare:nNnT { \__enumext_keyans_pic_level_int } = { 1 }
1186   {
1187     \msg_error:nnn { enumext } { wrong-miniright-place }
1188   }
1189   \int_compare:nNnT { \__enumext_level_int } = { 0 }
1190   {
1191     \msg_error:nnn { enumext } { wrong-miniright-place }
1192   }
1193   \int_compare:nNnTF { \__enumext_keyans_level_int } = { 1 }
1194   {
1195     \__enumext_keyans_mini_right_cmd:n {#1}
1196   }
1197   { \__enumext_mini_right_cmd:n {#1} }
1198 }

```

(End of definition for `\miniright`. This function is documented on page 9.)

`__enumext_mini_right_cmd:n` The function `__enumext_mini_right_cmd:n` takes as argument the starred version ‘*’ of the `\miniright` command in the `enumext` environment. We check if the `mini-env` key is active via the variable `__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.

```

1199 \cs_new_protected:Npn \__enumext_mini_right_cmd:n #1
1200 {
1201   \dim_compare:nNnTF
1202   { \dim_use:c { \__enumext_minipage_right_ \__enumext_level: _dim } } > { \c_zero_dim }
1203   {
1204     \__enumext_multicols_stop:
1205     \end{\__enumext_mini_env*}
1206     \hfill
1207     \begin{\__enumext_mini_env*}
1208     { \dim_use:c { \__enumext_minipage_right_ \__enumext_level: _dim } }
1209     \par\addvspace { \__enumext_minipage_right_skip }
1210     \bool_if:nF {#1}
1211     {
1212       \centering
1213     }
1214     \int_gzero:N \g__enumext_minipage_stat_int
1215   }
1216   { \msg_error:nnn { enumext } { wrong-miniright-use } }
1217 }

```

(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 version* ‘`*`’ of the `\mini_right` 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.

```

1218 \cs_new_protected:Npn \__enumext_keyans_mini_right_cmd:n #1
1219 {
1220   \dim_compare:nNnTF { \l__enumext_minipage_right_v_dim } > { \c_zero_dim }
1221   {
1222     \__enumext_keyans_multicols_stop:
1223     \end{__enumext_mini_env*}
1224     \hfill
1225     \begin{__enumext_mini_env*}{ \l__enumext_minipage_right_v_dim }
1226     \par\addvspace { \l__enumext_minipage_right_skip }
1227     \bool_if:nF {#1}
1228     {
1229       \centering
1230     }
1231     \int_gzero:N \g__enumext_minipage_stat_int
1232   }
1233   { \msg_error:nnn { enumext } { wrong-miniright-use } }
1234 }

```

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

10.20 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.

```

1235 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
1236 {
1237   \keys_define:nn { enumext / #1 }
1238   {
1239     above .skip_set:c = { \l__enumext_vspace_above_#2_skip },
1240     above .value_required:n = true,
1241     above* .code:n      = \bool_set_true:c { \l__enumext_vspace_a_star_#2_bool }
1242                      \keys_set:nn { enumext / #1 } { above = {##1} },
1243     above* .value_required:n = true,
1244     below .skip_set:c = { \l__enumext_vspace_below_#2_skip },
1245     below .value_required:n = true,
1246     below* .code:n      = \bool_set_true:c { \l__enumext_vspace_b_star_#2_bool }
1247                      \keys_set:nn { enumext / #1 } { below = {##1} },
1248     below* .value_required:n = true,
1249   }
1250 }
1251 \clist_map_inline:Nn \c__enumext_all_envs_clist { \__enumext_tmp:nn #1 }

```

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

10.20.1 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.

```

1252 \cs_new_protected:Nn \__enumext_vspace_above:
1253 {
1254   \skip_if_eq:nnF
1255   { \skip_use:c { \l__enumext_vspace_above_ \__enumext_level: _skip } } { \c_zero_skip }
1256   {
1257     \bool_if:cTF { \l__enumext_vspace_a_star_ \__enumext_level: _bool }
1258     {
1259       \vspace*{ \skip_use:c { \l__enumext_vspace_above_ \__enumext_level: _skip } }
1260     }
1261     {
1262       \vspace { \skip_use:c { \l__enumext_vspace_above_ \__enumext_level: _skip } }
1263     }
1264   }
1265 }

```

(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.

```

1266 \cs_new_protected:Nn \__enumext_vspace_below:
1267 {
1268   \skip_if_eq:nnF
1269     { \skip_use:c { \__enumext_vspace_below_ \__enumext_level: _skip } } { \c_zero_skip }
1270   {
1271     \bool_if:cTF { \__enumext_vspace_b_star_ \__enumext_level: _bool }
1272     {
1273       \vspace*{ \skip_use:c { \__enumext_vspace_below_ \__enumext_level: _skip } }
1274     }
1275     {
1276       \vspace { \skip_use:c { \__enumext_vspace_below_ \__enumext_level: _skip } }
1277     }
1278   }
1279 }

```

(End of definition for `__enumext_vspace_below:`.)

10.20.2 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.

```

1280 \cs_new_protected:Nn \__enumext_vspace_above_v:
1281 {
1282   \skip_if_eq:nnF { \__enumext_vspace_above_v_skip } { \c_zero_skip }
1283   {
1284     \bool_if:NTF \__enumext_vspace_a_star_v_bool
1285     {
1286       \vspace*{ \__enumext_vspace_above_v_skip }
1287     }
1288     { \vspace { \__enumext_vspace_above_v_skip } }
1289   }
1290 }

```

(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.

```

1291 \cs_new_protected:Nn \__enumext_vspace_below_v:
1292 {
1293   \skip_if_eq:nnF { \__enumext_vspace_below_v_skip } { \c_zero_skip }
1294   {
1295     \bool_if:NTF \__enumext_vspace_b_star_v_bool
1296     {
1297       \vspace*{ \__enumext_vspace_below_v_skip }
1298     }
1299     { \vspace { \__enumext_vspace_below_v_skip } }
1300   }
1301 }

```

(End of definition for `__enumext_vspace_below_v:`.)

10.20.3 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 *vertical space above* the `enumext*` and `keyans*` environments set by the `above` and `above*` keys.

`__enumext_vspace_above_viii:`

```

1302 \cs_new_protected:Nn \__enumext_vspace_above_vii:
1303 {
1304   \skip_if_eq:nnF { \__enumext_vspace_above_vii_skip } { \c_zero_skip }
1305   {
1306     \bool_if:NTF \__enumext_vspace_a_star_vii_bool
1307     {
1308       \vspace*{ \__enumext_vspace_above_vii_skip }
1309     }
1310     { \vspace { \__enumext_vspace_above_vii_skip } }
1311   }
1312 }
1313 \cs_new_protected:Nn \__enumext_vspace_above_viii:
1314 {
1315   \skip_if_eq:nnF { \__enumext_vspace_above_viii_skip } { \c_zero_skip }

```

```

1316     {
1317         \bool_if:NTF \l__enumext_vspace_a_star_viii_bool
1318         {
1319             \vspace*{ \l__enumext_vspace_above_viii_skip }
1320         }
1321         { \vspace { \l__enumext_vspace_above_viii_skip } }
1322     }
1323 }

```

(End of definition for \l__enumext_vspace_above_vii: and \l__enumext_vspace_above_viii:.)

The functions \l__enumext_vspace_below_vii: and \l__enumext_vspace_below_viii: apply the vertical space below the **enumext*** and **keyans*** environments set by the **below*** and **below** keys.

```

1324 \cs_new_protected:Nn \l__enumext_vspace_below_vii:
1325 {
1326     \skip_if_eq:nnF { \l__enumext_vspace_below_vii_skip } { \c_zero_skip }
1327     {
1328         \bool_if:NTF \l__enumext_vspace_b_star_vii_bool
1329         {
1330             \vspace*{ \l__enumext_vspace_below_vii_skip }
1331         }
1332         { \vspace { \l__enumext_vspace_below_vii_skip } }
1333     }
1334 }
1335 \cs_new_protected:Nn \l__enumext_vspace_below_viii:
1336 {
1337     \skip_if_eq:nnF { \l__enumext_vspace_below_viii_skip } { \c_zero_skip }
1338     {
1339         \bool_if:NTF \l__enumext_vspace_b_star_viii_bool
1340         {
1341             \vspace*{ \l__enumext_vspace_below_viii_skip }
1342         }
1343         { \vspace { \l__enumext_vspace_below_viii_skip } }
1344     }
1345 }

```

(End of definition for \l__enumext_vspace_below_vii: and \l__enumext_vspace_below_viii:.)

10.21 Setting save-ans and resume keys

The key **save-ans** is directly associated with the key **resume**, this will activate the entire “storage system” in the **enumext** package.

We define the keys **save-ans**, **series**, **resume** and **resume*** only for the “first level” of **enumext** and **enumext***.

```

save-ans
series
resume
resume*
1346 \keys_define:nn { enumext / level-1 }
1347 {
1348     save-ans .code:n = \l__enumext_storing_set:n {#1},
1349     save-ans .value_required:n = true,
1350     series .str_set:N = \l__enumext_series_str,
1351     series .value_required:n = true,
1352     resume .code:n = \l__enumext_resume_series:n {#1},
1353     resume* .code:n = \l__enumext_resume_starred:,
1354     resume* .value_forbidden:n = true,
1355 }
1356 \keys_define:nn { enumext / enumext* }
1357 {
1358     save-ans .code:n = \l__enumext_storing_set_vii:n {#1},
1359     save-ans .value_required:n = true,
1360     series .str_set:N = \l__enumext_series_str,
1361     series .value_required:n = true,
1362     resume .code:n = \l__enumext_resume_counter_series_vii:n {#1},
1363     resume* .code:n = \l__enumext_resume_starred_vii:,
1364     resume* .value_forbidden:n = true,
1365 }

```

(End of definition for save-ans and others.)

10.21.1 Internal function for save-ans key

__enumext_storing_set:n
 __enumext_storing_exec:

The function __enumext_storing_set:n executed by the `save-ans` key sets the parameters for the operation of `\anskey`, `keyans`, `keyans*` and `keyanspic`. The variable __enumext_store_name_tl will have the “store name” with which the `<sequence>` and `<prop list>` will be created, if it does not exist it will create it globally.

The boolean var __enumext_store_active_bool will be set to true activating the entire internal *storage mechanism*, then the integer variable for the `resume` key will be created (if not exist).

```

1366 \cs_new_protected:Npn \__enumext_storing_set:n #1
1367 {
1368   \tl_set:Nc \__enumext_store_name_tl {#1}
1369   \tl_if_empty:NTF \__enumext_store_name_tl
1370   {
1371     \msg_error:nnn { enumext } { save-ans-empty } { enumext }
1372   }
1373   {
1374     \__enumext_storing_standar:
1375   }
1376 }
1377 \cs_new_protected:Npn \__enumext_storing_set_vii:n #1
1378 {
1379   \tl_set:Nc \__enumext_store_name_tl {#1}
1380   \tl_if_empty:NTF \__enumext_store_name_tl
1381   {
1382     \msg_error:nnn { enumext } { save-ans-empty } { enumext* }
1383   }
1384   {
1385     \__enumext_storing_starred:
1386   }
1387 }
1388 \cs_new_protected:Nn \__enumext_storing_standar:
1389 {
1390   \bool_if:NTF \__enumext_standar_level_one_bool
1391   {
1392     \__enumext_storing_exec:
1393   }
1394   {
1395     \msg_warning:nnn { enumext } { save-ans-nested } { enumext }
1396   }
1397 }
1398 \cs_new_protected:Nn \__enumext_storing_starred:
1399 {
1400   \bool_if:NTF \__enumext_starred_level_one_bool
1401   {
1402     \__enumext_storing_exec:
1403   }
1404   {
1405     \msg_warning:nnn { enumext } { save-ans-nested } { enumext* }
1406   }
1407 }
1408 \cs_new_protected:Nn \__enumext_storing_exec:
1409 {
1410   \prop_if_exist:cF { g__enumext_ \__enumext_store_name_tl _prop }
1411   {
1412     \prop_new:c { g__enumext_ \__enumext_store_name_tl _prop }
1413   }
1414   \seq_if_exist:cF { g__enumext_ \__enumext_store_name_tl _seq }
1415   {
1416     \seq_new:c { g__enumext_ \__enumext_store_name_tl _seq }
1417   }
1418   \bool_set_true:N \__enumext_store_active_bool
1419   \bool_set_true:N \__enumext_store_ans_bool
1420   \int_if_exist:cF { g__enumext_resume_ \__enumext_store_name_tl _int }
1421   {
1422     \int_new:c { g__enumext_resume_ \__enumext_store_name_tl _int }
1423   }
1424 }

```

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

10.21.2 Internal function for series key

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, but, discarding some specific `<keys>`.

```

__enumext_filter_series:n
  __enumext_filter_series_key:n
  __enumext_filter_series_pair:nn

```

The function `__enumext_filter_series:n` will be in charge of filtering the `<keys>` we want to store where `{#1}` represents the optional value passed to the environment.

```

1425 \cs_new:Npn __enumext_filter_series:n #1
1426 {
1427   \use:e
1428   {
1429     \keyval_parse:NNn
1430     __enumext_filter_series_key:n
1431     __enumext_filter_series_pair:nn {#1}
1432   }
1433 }

```

The function `__enumext_filter_series_key:n` will be responsible for filtering the `<keys>` that are passed *without value* by excluding the `resume` and `resume*` keys.

```

1434 \cs_new:Npn __enumext_filter_series_key:n #1
1435 {
1436   \str_case:nnF {#1}
1437   {
1438     { resume } {}
1439     { resume* } {}
1440   }
1441   { , { \exp_not:n {#1} } }
1442 }

```

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

```

1443 \cs_new:Npn __enumext_filter_series_pair:nn #1#2
1444 {
1445   \str_case:nnF {#1}
1446   {
1447     { series } {}
1448     { resume } {}
1449     { save-key } {}
1450     { save-ans } {}
1451   }
1452   { , { \exp_not:n {#1} } = { \exp_not:n {#2} } }
1453 }

```

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

```

__enumext_parse_series_name:n
__enumext_resume_last:n

```

The function `__enumext_parse_series_name:n` will be in charge of saving the filtered `<keys>` in a global variable `\g__enumext_series_<series name>_tl` created globally when using the key `series`, otherwise it will call the function `__enumext_resume_last:n`. This function is passed to the function `__enumext_parse_keys_parse_keys:n` in the `enumext` environment definition (§10.32) and to the function `__enumext_parse_keys_vii:n` in the `enumext*` environment definition (§10.35).

```

1454 \cs_new_protected:Npn __enumext_parse_series_name:n #1
1455 {
1456   \str_if_empty:NTF \l__enumext_series_str
1457   {
1458     __enumext_resume_last:n {#1}
1459   }
1460   {
1461     \tl_gclear_new:c { g__enumext_series_ \l__enumext_series_str_tl }
1462     \tl_gset:ce { g__enumext_series_ \l__enumext_series_str_tl }
1463     { __enumext_filter_series:n {#1} }
1464     \int_if_exist:cF { g__enumext_series_ \l__enumext_series_str_int }
1465     {
1466       \int_new:c { g__enumext_series_ \l__enumext_series_str_int }
1467     }
1468   }
1469 }

```

The function `__enumext_resumext_series_default: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.

```

1470 \cs_new_protected:Npn \__enumext_resume_last:n #1
1471 {
1472   \bool_if:NT \l__enumext_standar_level_one_bool
1473   {
1474     %%\typeout{[[ON-LEVEL-ONE-ENUMEXT]]}
1475     \tl_gclear:N \g__enumext_standar_series_tl
1476     \tl_gset:Ne \g__enumext_standar_series_tl { \__enumext_filter_series:n {#1} }
1477   }
1478   \bool_if:NT \l__enumext_starred_level_one_bool
1479   {
1480     %%\typeout{[[ON-LEVEL-ONE-ENUMEXT*]]}
1481     \tl_gclear:N \g__enumext_starred_series_tl
1482     \tl_gset:Ne \g__enumext_starred_series_tl { \__enumext_filter_series:n {#1} }
1483   }
1484 }

```

(End of definition for `__enumext_parse_series_name:n` and `__enumext_resume_last:n`)

10.21.3 Internal function for resume and resume* keys

The keys `resume` without assigned value and `resume*` reset the *counter* of the list according to the last value of the counter of the previous list, the first one only the *counter* and the second one with the optional values filtered from the last non-nested list in which the key `series` is not present. When assigning value to `resume={⟨series name⟩}` it will use the previous values of the list in which the `series={⟨series name⟩}` key was executed.

```

\__enumext_resume_series:n
\__enumext_resume_counter:n
\__enumext_resume_starred:

```

The function `__enumext_resume_series:n` will handle the argument passed to the `resume` key in the `enumext` environment. 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` environment in which the `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.

```

1485 \cs_new_protected:Npn \__enumext_resume_series:n #1
1486 {
1487   \tl_if_empty:nTF {#1}
1488   {
1489     \__enumext_resume_counter:n { }
1490   }
1491   {
1492     \tl_if_exist:cTF { g__enumext_series_ \tl_to_str:n {#1} _tl }
1493     {
1494       \__enumext_resume_counter:n {#1}
1495       \keys_set:nv { enumext / level-1 }
1496       { g__enumext_series_ \tl_to_str:n {#1} _tl }
1497     }
1498     { \msg_error:nnn { enumext } { unknown-series } {#1} }
1499   }
1500 }
1501 \cs_new_protected:Npn \__enumext_resume_counter:n #1
1502 {
1503   \tl_if_empty:nTF {#1}
1504   {
1505     \int_gincr:N \g__enumext_resume_int
1506     \int_set_eq:NN \l__enumext_start_i_int \g__enumext_resume_int
1507   }
1508   {
1509     \tl_set:Nn \l__enumext_resume_name_tl {#1}
1510     \int_set:Nn \l__enumext_start_i_int
1511     {
1512       \int_use:c { g__enumext_series_ \l__enumext_resume_name_tl _int } + 1
1513     }
1514   }
1515   % Si está la llave save-ans=activa
1516   \bool_lazy_and:nnT
1517   { \bool_if_p:N \l__enumext_standar_level_one_bool }
1518   { \bool_if_p:N \l__enumext_store_active_bool }
1519   {
1520     \int_set:Nn \l__enumext_start_i_int

```

```

1521         {
1522             \int_use:c { g__enumext_resume_ \l__enumext_store_name_tl _int } + 1
1523         }
1524     }
1525 }
1526 \cs_new_protected:Nn \__enumext_resume_starred:
1527 {
1528     \tl_if_empty:NF \g__enumext_standar_series_tl
1529     {
1530         \__enumext_resume_counter:n { }
1531         \keys_set:nV { enumext / level-1 } \g__enumext_standar_series_tl
1532     }
1533 }

```

(End of definition for __enumext_resume_series:n, __enumext_resume_counter:n, and __enumext_resume_starred:.)

```

\__enumext_resume_counter_series_vii:n
\__enumext_resume_counter_vii:
\__enumext_resume_starred_vii:
1534 \cs_new_protected:Npn \__enumext_resume_counter_series_vii:n #1
1535 {
1536     \tl_if_empty:nTF {#1}
1537     {
1538         \__enumext_resume_counter_vii:
1539     }
1540     {
1541         \tl_if_exist:cTF { g__enumext_series_ \tl_to_str:n {#1} _tl }
1542         {
1543             \__enumext_resume_counter_vii:
1544             \keys_set:nv { enumext / enumext* }
1545             { g__enumext_series_ \tl_to_str:n {#1} _tl }
1546         }
1547         { \msg_error:nnn { enumext } { unknown-series } {#1} }
1548     }
1549 }
1550 \cs_new_protected:Nn \__enumext_resume_counter_vii:
1551 {
1552     \bool_lazy_and:nnT
1553     { \bool_if_p:N \l__enumext_starred_level_one_bool }
1554     { \bool_if_p:N \l__enumext_store_active_bool }
1555     {
1556         \int_gset:Nn \g__enumext_resume_vii_int
1557         {
1558             \int_use:c { g__enumext_resume_ \l__enumext_store_name_tl _int }
1559         }
1560     }
1561     \int_gincr:N \g__enumext_resume_vii_int
1562     \int_set_eq:NN \l__enumext_start_vii_int \g__enumext_resume_vii_int
1563 }
1564 \cs_new_protected:Nn \__enumext_resume_starred_vii:
1565 {
1566     \tl_if_empty:NF \g__enumext_starred_series_tl
1567     {
1568         \__enumext_resume_counter_vii:
1569         \keys_set:nV { enumext / enumext* } \g__enumext_starred_series_tl
1570     }
1571 }

```

(End of definition for __enumext_resume_counter_series_vii:n, __enumext_resume_counter_vii:, and __enumext_resume_starred_vii:.)

10.22 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_count_item_number_int` must match the integer variable `\g__enumext_count_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.

10.22.1 Setting check-ans key

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

check-ans

no-store

```

1572 \cs_set_protected:Npn \__enumext_tmp:n #1
1573 {
1574   \keys_define:nn { enumext / #1 }
1575   {
1576     check-ans .bool_set:N = \l__enumext_check_ans_bool,
1577     check-ans .initial:n = false,
1578     no-store .code:n = {
1579       \bool_set_false:N \l__enumext_store_ans_bool
1580       \bool_set_false:N \l__enumext_check_ans_bool
1581     },
1582     no-store .value_forbidden:n = true,
1583   }
1584 }
1585 \clist_map_inline:nn
1586 {
1587   level-1, level-2, level-3, level-4, enumext*
1588 }
1589 { \__enumext_tmp:n {#1} }
```

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

10.22.2 Set-up check answer mechanism

__enumext_check_ans_set:

The function `__enumext_check_ans_set:` will adjust the value of the variable `\g__enumext_count_item_number_int` by decrementing its value by one each time you open a nested level `enumext` environment.

```

1590 \cs_new_protected:Nn \__enumext_check_ans_set:
1591 {
1592   \int_case:nn { \l__enumext_level_int }
1593   {
1594     { 1 }{
1595       \bool_lazy_all:nT
1596       {
1597         { \bool_if_p:N \g__enumext_starred_bool }
1598         { \int_compare_p:nNn { \l__enumext_level_h_int } = { 1 } }
1599       }
1600       {
1601         \int_gdecr:N \g__enumext_count_item_number_int
1602         \typeout{ENUMEXT ~ STANDAR ~ NEEEEEEEEEEEEESTED}
1603       }
1604     }
1605     { 2 }{
1606       \int_gdecr:N \g__enumext_count_item_number_int
1607     }
1608     { 3 }{
1609       \int_gdecr:N \g__enumext_count_item_number_int
1610     }
1611     { 4 }{
1612       \int_gdecr:N \g__enumext_count_item_number_int
1613     }
1614   }
```

```

1614     }
1615     \int_case:nn { \l__enumext_level_h_int }
1616     {
1617         { 1 }{
1618             \bool_if:NT \g__enumext_standar_bool
1619             {
1620                 \int_gdecr:N \g__enumext_count_item_number_int
1621                 \typeout{ENUMEXT ~ STARRED ~ NEEEEEEEEEEEEESTED}
1622             }
1623         }
1624     }
1625 }

```

(End of definition for __enumext_check_ans_set:.)

__enumext_check_ans_exec: The function __enumext_check_ans_exec: will count the number of times the \item and \item* commands appears per level within the enumext environment. The boolean variable \l__enumext_store_ans_bool controlled by the no-store key will increment the integer variable of the level counter by 1 to preserve the equality that we will use in the final comparison of the process.

```

1626 \cs_new_protected:Nn \__enumext_check_ans_exec:
1627 {
1628     \bool_if:NT \l__enumext_check_ans_bool
1629     {
1630         \__enumext_check_ans_set:
1631     }
1632 }

```

(End of definition for __enumext_check_ans_exec:.)

__enumext_check_ans_show: The function __enumext_check_ans_show: compares all executions of \item and \item* with the executions of \anskey. After the function is executed, we set the integer variables to zero.

```

1633 \cs_new_protected:Nn \__enumext_check_ans_show:
1634 {
1635     \int_compare:nNnTF
1636     { \g__enumext_count_item_number_int } = { \g__enumext_count_item_anskey_int }
1637     {
1638         \msg_term:nnV { enumext } { items-same-answer } \g__enumext_store_name_tl
1639     }
1640     {
1641         \msg_warning:nnV { enumext } { item-different-answer } \g__enumext_store_name_tl
1642     }
1643     \int_gzero:N \g__enumext_count_item_number_int
1644     \int_gzero:N \g__enumext_count_item_anskey_int
1645 }

```

(End of definition for __enumext_check_ans_show:.)

10.23 Keys and functions associated with storage

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*.

```

1646 \cs_set_protected:Npn \__enumext_tmp:n #1
1647 {
1648     \keys_define:nn { enumext / #1 }
1649     {
1650         wrap-ans .cs_set_protected:Np = \__enumext_anskey_wrapper:n ##1,
1651         wrap-ans .initial:n = \fbox{##1},
1652         wrap-ans .value_required:n = true,
1653         wrap-opt .cs_set_protected:Np = \__enumext_keyans_wrapper_opt:n ##1,
1654         wrap-opt .initial:n = [{##1}],
1655         wrap-opt .value_required:n = true,
1656         save-sep .tl_set:N = \l__enumext_store_keyans_item_opt_sep_tl,
1657         save-sep .initial:n = {, ~ },
1658         save-sep .value_required:n = true,
1659         mark-ans .tl_set:N = \l__enumext_mark_answer_sym_tl,
1660         mark-ans .initial:n = \textasteriskcentered,
1661         mark-ans .value_required:n = true,
1662         mark-pos .choice:,
1663         mark-pos / left .code:n = \str_set:Nn \l__enumext_mark_position_str { l },
1664         mark-pos / right .code:n = \str_set:Nn \l__enumext_mark_position_str { r },

```

```

1665     mark-pos    .initial:n = right,
1666     mark-pos    .value_required:n = true,
1667     show-ans    .bool_set:N = \l__enumext_show_answer_bool,
1668     show-ans    .initial:n = false,
1669     show-ans    .value_required:n = true,
1670     show-pos    .bool_set:N = \l__enumext_show_position_bool,
1671     show-pos    .initial:n = false,
1672     show-pos    .value_required:n = true,
1673     mark-ref    .tl_set:N = \l__enumext_mark_ref_sym_tl,
1674     mark-ref    .initial:n = \textasteriskcentered,
1675     mark-ref    .value_required:n = true,
1676     save-ref    .bool_set:N = \l__enumext_store_ref_key_bool,
1677     save-ref    .initial:n = false,
1678     save-ref    .value_required:n = true,
1679   }
1680 }
1681 \clist_map_inline:nn { level-1, enumext* } { \__enumext_tmp:n {#1} }

```

(End of definition for wrap-ans and others.)

mark-pos For the **keyans** and **keyans*** environments we will only add the keys mark-pos, show-ans and show-
 show-ans pos.

```

1682 \cs_set_protected:Npn \__enumext_tmp:n #1
1683 {
1684   \keys_define:nn { enumext / #1 }
1685   {
1686     mark-pos .choice:,
1687     mark-pos / left .code:n = \str_set:Nn \l__enumext_mark_position_str { l },
1688     mark-pos / right .code:n = \str_set:Nn \l__enumext_mark_position_str { r },
1689     mark-pos .initial:n = right,
1690     mark-pos .value_required:n = true,
1691     show-ans .bool_set:N = \l__enumext_show_answer_bool,
1692     show-ans .initial:n = false,
1693     show-ans .value_required:n = true,
1694     show-pos .bool_set:N = \l__enumext_show_position_bool,
1695     show-pos .initial:n = false,
1696     show-pos .value_required:n = true,
1697   }
1698 }
1699 \clist_map_inline:nn { keyans, keyans* } { \__enumext_tmp:n {#1} }

```

(End of definition for mark-pos and show-ans.)

columns* For the **enumext** and **enumext*** environments we will only add the keys **columns*** and **columns-sep***.
 columns-sep* The values set by these keys will be passed as optional arguments to the “inner levels” of the **enumext** and **enumext*** environments via the `__enumext_store_level_open:` function used by the “storage system” to preserve the structure and then used by the `\printkeyans` command.

```

1700 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
1701 {
1702   \keys_define:nn { enumext / #1 }
1703   {
1704     columns* .code:n = \bool_set_true:c { \l__enumext_store_columns_#2_bool }
1705     \int_set:cn { \l__enumext_store_columns_#2_int } {##1}
1706     \tl_put_right:ce { \l__enumext_store_opt_#2_tl }
1707       {
1708         columns = \exp_not:v { \l__enumext_store_columns_#2_int },
1709       },
1710     columns* .value_required:n = true,
1711     columns-sep* .code:n = \bool_set_true:c { \l__enumext_store_columns_sep_#2_bool }
1712     \dim_set:cn { \l__enumext_store_columns_sep_#2_dim } {##1}
1713     \tl_put_right:ce { \l__enumext_store_opt_#2_tl }
1714       {
1715         columns-sep = \exp_not:v { \l__enumext_store_columns_sep_#2_dim },
1716       },
1717     columns-sep* .value_required:n = true,
1718   }
1719 }
1720 \clist_map_inline:nn
1721 {
1722   {level-1}{i}, {level-2}{ii}, {level-3}{iii}, {level-4}{iv}, {enumext*}{vii}
1723 }
1724 { \__enumext_tmp:nn #1 }

```

(End of definition for `columns*` and `columns-sep*`.)

10.23.1 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 $\langle prop\ list \rangle$ 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 $\langle prop\ list \rangle$ is $\{\langle position \rangle\}\{\langle content \rangle\}$. This function is used by `\anskey` in `enumext` and `enumext*` environments, `\item*` in `keyans` and `keyans*` environments and `\anspic` in `keyanspic` environment.

```

1725 \cs_generate_variant:Nn \prop_gput_if_not_in:Nnn { cen }
1726 \cs_new_protected:Npn \__enumext_store_addto_prop:n #1
1727 {
1728   \prop_gput_if_not_in:cen { g__enumext_ \l__enumext_store_name_tl _prop }
1729   {
1730     \int_eval:n { \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop } + 1 }
1731   }
1732   { #1 }
1733 }
1734 \cs_generate_variant:Nn \__enumext_store_addto_prop:n { V }

```

(End of definition for `__enumext_store_addto_prop:n`.)

10.23.2 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 $\langle sequence \rangle$ 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 $\langle sequence \rangle$ 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.

```

1735 \cs_new_protected:Npn \__enumext_store_addto_seq:n #1
1736 {
1737   \seq_gput_right:cn { g__enumext_ \l__enumext_store_name_tl _seq } { #1 }
1738 }
1739 \cs_generate_variant:Nn \__enumext_store_addto_seq:n { v, V }

```

(End of definition for `__enumext_store_addto_seq:n`.)

10.23.3 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. As this structure will be stored in the sequence set by the `save-ans` key, we will not be able to modify it locally, so it is better to take only two copies of the values set by the `columns` and `columns-sep` keys if they are present when changing levels within the `enumext` environment when executing `\anskey`. We will store these values in the variable `\l__enumext_store_columns_X_tl` if they are different from `0` and `0pt` and pass them as an optional argument to the environment stored in the sequence `enumext`.

```

1740 \cs_new_protected:Nn \__enumext_store_level_open:
1741 {
1742   \bool_if:NT \l__enumext_store_ans_bool
1743   {
1744     \tl_if_empty:cTF { l__enumext_store_opt_ \__enumext_level: _tl }
1745     {
1746       \__enumext_store_addto_seq:n
1747       {
1748         \item \begin{enumext}
1749       }
1750     }
1751     {
1752       \tl_put_left:cn { l__enumext_store_opt_ \__enumext_level: _tl }
1753       {
1754         \item \begin{enumext} [
1755       }
1756       \tl_put_right:cn { l__enumext_store_opt_ \__enumext_level: _tl }
1757       {
1758       ]
1759       }
1760       \__enumext_store_addto_seq:v { l__enumext_store_opt_ \__enumext_level: _tl }
1761     }
1762   }
1763 }
1764 \cs_new_protected:Nn \__enumext_store_level_close:
1765 {

```

```

1766 \bool_if:NT \l__enumext_store_ans_bool
1767 {
1768   \__enumext_store_addto_seq:n { \end{enumext} }
1769 }
1770 }

```

(End of definition for __enumext_store_level_open: and __enumext_store_level_close:.)

```

\__enumext_store_level_open_vii:
\__enumext_store_level_close_vii:

```

When nesting the `enumext*` environment in `enumext` starting right after `\item` (without material between them) there is a problem with the alignment of the labels with the baseline between the two environments. One way to get around this problem is to place `\mode_leave_vertical:` and then apply `\vspace` taking into account `\baselineskip`, the value of `\parsep` of the current level of `enumext` and the value of `\topsep` of the `enumext*` environment.

```

1771 \cs_new_protected:Nn \__enumext_store_level_open_vii:
1772 {
1773   \bool_if:NT \l__enumext_store_ans_bool
1774   {
1775     \tl_if_empty:NTF \l__enumext_store_opt_vii_tl
1776     {
1777       \__enumext_store_addto_seq:n
1778       {
1779         \item \mode_leave_vertical:
1780         \vspace { -\skip_eval:n { \baselineskip + \parsep } }
1781         \begin{enumext*}[before={\setlength{\topsep}{\opt}},]
1782       }
1783     }
1784     {
1785       \tl_put_left:Nn \l__enumext_store_opt_vii_tl
1786       {
1787         \item \mode_leave_vertical:
1788         \vspace { -\skip_eval:n { \baselineskip + \parsep } }
1789         \begin{enumext*}[before={\setlength{\topsep}{\opt}},
1790       }
1791       \tl_put_right:Nn \l__enumext_store_opt_vii_tl
1792       {
1793         ]
1794       }
1795       \__enumext_store_addto_seq:V \l__enumext_store_opt_vii_tl
1796     }
1797   }
1798 }
1799 \cs_new_protected:Nn \__enumext_store_level_close_vii:
1800 {
1801   \bool_if:NT \l__enumext_store_ans_bool
1802   {
1803     \__enumext_store_addto_seq:n { \end{enumext*} }
1804   }
1805 }

```

(End of definition for __enumext_store_level_open_vii: and __enumext_store_level_close_vii:.)

10.23.4 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`

```

1806 \cs_new_protected:Nn \__enumext_print_keyans_box:NN
1807 {
1808   \mode_leave_vertical:
1809   \skip_horizontal:n { -\dim_use:N #2 }
1810   \makebox[\opt][ r ]
1811   {
1812     \makebox[ \dim_use:N #1 ][ \l__enumext_mark_position_str ]
1813     {
1814       \tl_use:N \l__enumext_mark_answer_sym_tl
1815     }
1816   }
1817   \skip_horizontal:n { \dim_use:N #2 }
1818 }
1819 \cs_generate_variant:Nn \__enumext_print_keyans_box:NN { cc }

```


(End of definition for `__enumext_print_keyans_box:NN`.)

10.24 The command `\anskey` and internal label and ref

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 very similar behaviour to that of `\item` in the `enumext` and `enumext*` environments.

`\anskey` We want the command to be executed as follows: `\anskey(<number>)*[<key = val>]{<content>}` so first we’ll add the keys `item-sym*`, `item-pos*` and `store-brk`.

```

1820 \keys_define:nn { enumext / anskey }
1821 {
1822   item-sym* .tl_set:N = \l__enumext_store_item_symbol_tl,
1823   item-sym* .value_required:n = true,
1824   item-pos* .dim_set:N = \l__enumext_store_item_symbol_sep_dim,
1825   item-pos* .value_required:n = true,
1826   store-brk .bool_set:N = \l__enumext_store_columns_break_bool,
1827   store-brk .default:n = true,
1828   store-brk .value_forbidden:n = true,
1829 }

```

This command `\anskey` will only be present when using the `save-ans` key in `enumext` and `enumext*` environments, otherwise it will return an error. If the `check-ans` key is active, increment `\g__enumext_count_item_with_ans_int`, then call internal function `__enumext_store_anskey_code:nnnn` will “*store content*” in the *(sequence)* and in the *(prop list)*.

```

1830 \NewDocumentCommand \anskey { d() s o +m }
1831 {
1832   \bool_if:NF \l__enumext_store_active_bool
1833   {
1834     \msg_error:nnnn { enumext } { anskey-wrong-place } { anskey } { enumext }
1835   }
1836   \int_compare:nNt { \l__enumext_keyans_level_int } = { 1 }
1837   {
1838     \msg_error:nnnn { enumext } { command-wrong-place } { anskey } { keyans }
1839   }
1840   \int_compare:nNt { \l__enumext_keyans_pic_level_int } = { 1 }
1841   {
1842     \msg_error:nnnn { enumext } { command-wrong-place } { anskey } { keyanspic }
1843   }
1844   \group_begin:
1845     \bool_if:NT \l__enumext_store_ans_bool
1846     {
1847       \bool_if:NT \l__enumext_check_ans_bool
1848       {
1849         \int_gincr:N \g__enumext_count_item_anskey_int
1850       }
1851       \__enumext_store_anskey_code:nnnn {#1} {#2} {#3} {#4}
1852     }
1853   \group_end:
1854 }

```

(End of definition for `\anskey`. This function is documented on page 10.)

`__enumext_store_anskey_code:nnnn`

The internal function `__enumext_store_anskey_code:nnnn` first we pass the command *(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)* passed to the command.

```

1855 \cs_new_protected:Npn \__enumext_store_anskey_code:nnnn #1 #2 #3 #4
1856 {
1857   \__enumext_store_addto_prop:n {#4}
1858   \bool_if:NT \l__enumext_store_ref_key_bool
1859   {
1860     \__enumext_store_internal_ref:
1861   }
1862   \__enumext_store_anskey_show_left:n { #4 }

```

Now we start processing the optional arguments 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 `[<key = val>]`, if the `store-brk` key is present and

the command is running under `enumext` (not in the starred version) we will add `\columnbreak` and then `\item`.

```

1863 \tl_clear:N \l__enumext_store_anskey_arg_tl
1864 \tl_if_novalue:nF {#3}
1865 {
1866   \keys_set:nn { enumext / anskey } {#3}
1867 }
1868 \bool_lazy_and:nnT
1869 { \bool_if_p:N \l__enumext_store_columns_break_bool }
1870 { \bool_not_p:n { \l__enumext_starred_bool } }
1871 {
1872   \tl_put_left:Nn \l__enumext_store_anskey_arg_tl { \columnbreak }
1873 }
1874 \tl_put_right:Nn \l__enumext_store_anskey_arg_tl { \item }

```

Now we will check the $\langle\langle number \rangle\rangle$ argument and add it to `\l__enumext_store_anskey_arg_tl` if the command is running under `enumext*` (starred version).

```

1875 \tl_if_novalue:nF {#1}
1876 {
1877   \int_set:Nn \l__enumext_store_columns_join_int {#1}
1878   \bool_if:NT \l__enumext_starred_bool
1879   {
1880     \tl_put_right:Ne \l__enumext_store_anskey_arg_tl
1881     {
1882       ( \exp_not:V \l__enumext_store_columns_join_int )
1883     }
1884   }
1885 }

```

And now we will review the starred argument `*` together with the keys `item-sym*` and `item-pos*` and pass them to `\l__enumext_store_anskey_arg_tl`.

```

1886 \bool_if:nTF {#2}
1887 {
1888   \tl_put_right:Nn \l__enumext_store_anskey_arg_tl { * }
1889   \tl_if_empty:NF \l__enumext_store_item_symbol_tl
1890   {
1891     \tl_put_right:Ne \l__enumext_store_anskey_arg_tl
1892     {
1893       [ \exp_not:V \l__enumext_store_item_symbol_tl ]
1894     }
1895   }
1896   \dim_compare:nT
1897   {
1898     \l__enumext_store_item_symbol_sep_dim != \c_zero_dim
1899   }
1900   {
1901     \tl_put_right:Ne \l__enumext_store_anskey_arg_tl
1902     {
1903       [ \exp_not:V \l__enumext_store_item_symbol_sep_dim ]
1904     }
1905   }
1906   \tl_put_right:Nn \l__enumext_store_anskey_arg_tl {#4}
1907 }
1908 {
1909   \tl_put_right:Nn \l__enumext_store_anskey_arg_tl {#4}
1910 }

```

Finally we check 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 in $\langle sequence \rangle$.

```

1911 \bool_lazy_and:nnT
1912 { \bool_if_p:N \l__enumext_store_ref_key_bool }
1913 { \bool_if_p:N \l__enumext_hyperref_bool }
1914 {
1915   \tl_put_right:Ne \l__enumext_store_anskey_arg_tl
1916   {
1917     \hfill \exp_not:N \hyperlink { \exp_not:V \l__enumext_newlabel_arg_one_tl }
1918     { \exp_not:V \l__enumext_mark_ref_sym_tl }
1919   }
1920 }
1921 \l__enumext_store_addto_seq:V \l__enumext_store_anskey_arg_tl
1922 }

```

(End of definition for `__enumext_store_anskey_code:nnnn`.)

`__enumext_store_internal_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`.

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 `__enumext_newlabel_arg_two_tl`.

```

1923 \cs_new_protected:Nn \__enumext_store_internal_ref:
1924 {
1925   \cs_set_protected:Npn \__enumext_tmp:n ##1
1926   {
1927     \tl_set_eq:cc { \__enumext_label_copy_##1_tl } { \__enumext_label_##1_tl }
1928     \tl_reverse:c { \__enumext_label_copy_##1_tl }
1929     \tl_remove_once:cn { \__enumext_label_copy_##1_tl } { . }
1930     \tl_reverse:c { \__enumext_label_copy_##1_tl }
1931   }
1932   \clist_map_inline:nn { i, ii, iii, iv, vii } { \__enumext_tmp:n {##1} }
1933   \cs_set:Npn \__enumext_tmp:n ##1
1934   { . \tl_use:c { \__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` is running alone in it or if it is running in a nested `enumext` environment within the starting environment.

```

1935 \bool_lazy_all:nT
1936 {
1937   { \bool_if_p:N \g__enumext_starred_bool }
1938   { \int_compare_p:nNn { \__enumext_level_int } = { \c_zero_int } }
1939 }
1940 {
1941   \tl_put_right:Ne \__enumext_newlabel_arg_two_tl
1942   { \tl_use:N \__enumext_label_copy_vii_tl }
1943 }
1944 \bool_lazy_all:nT
1945 {
1946   { \bool_if_p:N \l__enumext_standar_bool }
1947   { \bool_if_p:N \g__enumext_starred_bool }
1948   { \int_compare_p:nNn { \__enumext_level_int } > { \c_zero_int } }
1949 }
1950 {
1951   \tl_put_right:Ne \__enumext_newlabel_arg_two_tl
1952   {
1953     \tl_use:N \__enumext_label_copy_vii_tl
1954     \int_step_function:nnN { 1 } { \__enumext_level_int } \__enumext_tmp:n
1955   }
1956 }

```

If started with `enumext` and if `\anskey` is running alone in it or if it is running in a nested `enumext*` environment within the starting environment.

```

1957 \bool_lazy_all:nT
1958 {
1959   { \bool_if_p:N \l__enumext_standar_bool }
1960   { \int_compare_p:nNn { \__enumext_level_int } > { \c_zero_int } }
1961   { \int_compare_p:nNn { \__enumext_level_h_int } = { \c_zero_int } }
1962   { \bool_not_p:n { \g__enumext_starred_bool } }
1963 }
1964 {
1965   \tl_put_right:Ne \__enumext_newlabel_arg_two_tl
1966   {
1967     \tl_use:N \__enumext_label_copy_i_tl
1968     \int_step_function:nnN { 2 } { \__enumext_level_int } \__enumext_tmp:n
1969   }
1970 }
1971 \cs_set:Npn \__enumext_tmp:n ##1
1972 { \tl_use:c { \__enumext_label_copy_ \int_to_roman:n {##1} _tl } }
1973 \bool_lazy_all:nT
1974 {
1975   { \bool_if_p:N \l__enumext_standar_bool }
1976   { \int_compare_p:nNn { \__enumext_level_int } > { \c_zero_int } }
1977   { \bool_not_p:n { \g__enumext_starred_bool } }
1978   { \int_compare_p:nNn { \__enumext_level_h_int } > { \c_zero_int } }
1979 }
1980 {

```

```

1981         \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
1982         {
1983             \int_step_function:nnN { 1 } { \l__enumext_level_int } \l__enumext_tmp:n
1984             . \tl_use:N \l__enumext_label_copy_vii_tl
1985         }
1986     }

```

Now we set the variable `\l__enumext_newlabel_arg_one_tl` which will contain $\langle \textit{store name} : \textit{position} \rangle$.

```

1987     \tl_put_right:Ne \l__enumext_newlabel_arg_one_tl
1988     {
1989         \l__enumext_store_name_tl \c_colon_str
1990         \int_eval:n { \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop } }
1991     }

```

Now execute the function `\l__enumext_newlabel:nn` and save the result in the variable `\l__enumext_store_write_aux_file_tl` and finally we write in the `.aux` file.

```

1992     \tl_put_right:Ne \l__enumext_store_write_aux_file_tl
1993     {
1994         \l__enumext_newlabel:nn
1995         { \exp_not:V \l__enumext_newlabel_arg_one_tl }
1996         { \l__enumext_newlabel_arg_two_tl }
1997     }
1998     \l__enumext_store_write_aux_file_tl
1999 }

```

(End of definition for `\l__enumext_store_internal_ref:`)

`\l__enumext_store_anskey_show_wrap:n`

The function `\l__enumext_store_anskey_show_wrap:n` “wraps” the $\langle \textit{argument} \rangle$ passed to `\anskey` when using the `wrap-ans` key.

```

2000 \cs_new_protected:Npn \l__enumext_store_anskey_show_wrap:n #1
2001 {
2002     \par
2003     \bool_if:NT \l__enumext_starred_bool
2004     {
2005         \cs_set:Nn \l__enumext_level: { vii }
2006     }
2007     \l__enumext_print_keyans_box:cc
2008     { \l__enumext_labelwidth_ \l__enumext_level: _dim }
2009     { \l__enumext_labelsep_ \l__enumext_level: _dim }
2010     \l__enumext_anskey_wrapper:n { #1 }
2011 }

```

(End of definition for `\l__enumext_store_anskey_show_wrap:n`)

`\l__enumext_store_anskey_show_left:n`

The function `\l__enumext_store_anskey_show_left:n` will show the “mark” defined by the `mark-ans` key or the “position” of the content stored in the $\langle \textit{prop list} \rangle$ when using the `show-pos` key on the left margin next to the “wraps” $\langle \textit{argument} \rangle$ passed to `\anskey` on the right side when using the `show-ans` key.

```

2012 \cs_new_protected:Npn \l__enumext_store_anskey_show_left:n #1
2013 {
2014     \bool_if:NT \l__enumext_show_answer_bool
2015     {
2016         \l__enumext_store_anskey_show_wrap:n { #1 }
2017     }
2018     \bool_if:NT \l__enumext_show_position_bool
2019     {
2020         \tl_set:Nx \l__enumext_mark_answer_sym_tl
2021         {
2022             \group_begin:
2023             \exp_not:N \normalfont
2024             \exp_not:N \footnotesize [ \int_eval:n
2025             {
2026                 \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop }
2027             }
2028             ]
2029             \group_end:
2030         }
2031         \l__enumext_store_anskey_show_wrap:n { #1 }
2032     }
2033 }

```

(End of definition for `\l__enumext_store_anskey_show_left:n`)

10.25 Common functions for keyans, keyans* and keyanspic

10.25.1 Storing content in prop list

`__enumext_keyans_addto_prop:n`

The function `__enumext_keyans_addto_prop:n` will pass the contents of the current $\langle label \rangle$ `__enumext_label_v_tl` for the `keyans` environment and the current $\langle label \rangle$ `__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 `__enumext_store_keyans_label_tl` variable, which will be passed to the $\langle prop list \rangle$ defined by the `save-ans` key using the `__enumext_store_addto_prop:V`.

```

2034 \cs_new_protected:Npn \__enumext_keyans_addto_prop:n #1
2035 {
2036   \tl_clear:N \__enumext_store_keyans_label_tl
2037   \int_compare:nNnTF { \__enumext_keyans_pic_level_int } = { 1 }
2038   {
2039     \tl_put_right:Ne \__enumext_store_keyans_label_tl { \__enumext_label_vi_tl }
2040   }
2041   {
2042     \tl_put_right:Ne \__enumext_store_keyans_label_tl { \__enumext_label_v_tl }
2043   }
2044   \tl_if_novalue:nF { #1 }
2045   {
2046     % Set save-sep
2047     \tl_if_empty:NF \__enumext_store_keyans_item_opt_sep_tl
2048     {
2049       \tl_put_right:Ne \__enumext_store_keyans_label_tl { \__enumext_store_keyans_item_opt_sep_tl }
2050     }
2051     \tl_put_right:Ne \__enumext_store_keyans_label_tl { #1 }
2052   }
2053   \__enumext_store_addto_prop:V \__enumext_store_keyans_label_tl
2054 }

```

(End of definition for `__enumext_keyans_addto_prop:n`.)

10.25.2 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 $\langle label \rangle$. 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 $\langle labels \rangle$ and remove the dots “.” from them, we do not want to get double dots in our references.

```

2055 \cs_new_protected:Nn \__enumext_keyans_store_ref:
2056 {
2057   \bool_if:NT \__enumext_store_ref_key_bool
2058   {
2059     \cs_set_protected:Npn \__enumext_tmp:n ##1
2060     {
2061       \tl_set_eq:cc { \__enumext_label_copy_##1_tl } { \__enumext_label_##1_tl }
2062       \tl_reverse:c { \__enumext_label_copy_##1_tl }
2063       \tl_remove_once:cn { \__enumext_label_copy_##1_tl } { . }
2064       \tl_reverse:c { \__enumext_label_copy_##1_tl }
2065     }
2066     \clist_map_inline:nn { i, v, vi, vii, viii } { \__enumext_tmp:n {##1} }
2067     \__enumext_keyans_store_ref_aux_i:
2068   }
2069 }

```

The auxiliary function `__enumext_keyans_store_ref_aux_i:` set the variable `__enumext_newlabel_arg_one_tl` which will contain $\{ \langle store name : position \rangle \}$ analyzing whether the environment in which they are executed is `enumext*` or `enumext`.

```

2070 \cs_new_protected:Nn \__enumext_keyans_store_ref_aux_i:
2071 {
2072   \bool_if:NT \g__enumext_starred_bool
2073   {
2074     \tl_set_eq:NN \__enumext_label_copy_i_tl \__enumext_label_copy_vii_tl
2075   }
2076   \int_compare:nNnTF { \__enumext_keyans_pic_level_int } = { 1 }
2077   {
2078     \tl_put_right:Ne \__enumext_newlabel_arg_two_tl

```

```

2079         { \l__enumext_label_copy_i_tl . \l__enumext_label_copy_vi_tl }
2080     }
2081     \int_compare:nNt { \l__enumext_keyans_level_int } = { 1 }
2082     {
2083         \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2084         { \l__enumext_label_copy_i_tl . \l__enumext_label_copy_v_tl }
2085     }
2086     \int_compare:nNt { \l__enumext_keyans_level_h_int } = { 1 }
2087     {
2088         \tl_put_right:Ne \l__enumext_newlabel_arg_two_tl
2089         { \l__enumext_label_copy_i_tl . \l__enumext_label_copy_viii_tl }
2090     }
2091     \tl_put_right:Ne \l__enumext_newlabel_arg_one_tl
2092     {
2093         \l__enumext_store_name_tl \c_colon_str
2094         \int_eval:n { \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop } }
2095     }
2096     \__enumext_keyans_store_ref_aux_ii:
2097 }

```

Now auxiliary function `__enumext_keyans_store_ref_aux_ii:` save the result in the variable `\l__enumext_store_write_aux_file_tl` and finally we write in the `.aux` file.

```

2098 \cs_new_protected:Nn \__enumext_keyans_store_ref_aux_ii:
2099 {
2100     \tl_put_right:Ne \l__enumext_store_write_aux_file_tl
2101     {
2102         \__enumext_newlabel:nn
2103         { \exp_not:V \l__enumext_newlabel_arg_one_tl }
2104         { \l__enumext_newlabel_arg_two_tl }
2105     }
2106     \l__enumext_store_write_aux_file_tl
2107 }

```

(End of definition for `__enumext_keyans_store_ref:`, `__enumext_keyans_store_ref_aux_i:`, and `__enumext_keyans_store_ref_aux_ii:`.)

10.25.3 Storing content in sequence

```

\__enumext_keyans_addto_seq:n
\__enumext_keyans_addto_seq_link:

```

The function `__enumext_keyans_addto_seq:n` will pass the contents of the current *⟨label⟩* `\l__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_keyans_label_tl` variable to the sequence defined by the `save-ans` key.

```

2108 \cs_new_protected:Npn \__enumext_keyans_addto_seq:n #1
2109 {
2110     \tl_clear:N \l__enumext_store_keyans_label_tl
2111     \int_compare:nNtF { \l__enumext_keyans_pic_level_int } = { 1 }
2112     {
2113         \tl_put_right:Ne \l__enumext_store_keyans_label_tl { \item \l__enumext_label_vi_tl }
2114     }
2115     {
2116         \tl_put_right:Ne \l__enumext_store_keyans_label_tl { \item \l__enumext_label_v_tl }
2117     }
2118     \tl_if_novalue:nF { #1 }
2119     {
2120         \tl_if_empty:NF \l__enumext_store_keyans_item_opt_sep_tl
2121         {
2122             \tl_put_right:Ne \l__enumext_store_keyans_label_tl { \l__enumext_store_keyans_item_opt_sep_tl }
2123         }
2124         \tl_put_right:Ne \l__enumext_store_keyans_label_tl { #1 }
2125     }
2126     \__enumext_keyans_addto_seq_link:
2127 }

```

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_keyans_label_tl` into the global variable `\g__enumext_check_ans_item_tl` to be used by the function `__enumext_keyans_check_ans:nn` and increment the value of the integer variable `\g__enumext_count_item_anskey_int` handled by the `check-ans` key.

```

2128 \cs_new_protected:Nn \__enumext_keyans_addto_seq_link:
2129 {

```

```

2130 \bool_lazy_and:nnT
2131 { \bool_if_p:N \l__enumext_store_ref_key_bool }
2132 { \bool_if_p:N \l__enumext_hyperref_bool }
2133 {
2134   \tl_put_right:Ne \l__enumext_store_keyans_label_tl
2135   {
2136     \hfill \exp_not:N \hyperlink
2137     {
2138       \exp_not:V \l__enumext_newlabel_arg_one_tl
2139     }
2140     { \exp_not:V \l__enumext_mark_ref_sym_tl }
2141   }
2142 }
2143 \__enumext_store_addto_seq:V \l__enumext_store_keyans_label_tl
2144 \tl_gset:NV \g__enumext_check_ans_item_tl \l__enumext_store_keyans_label_tl
2145 \bool_if:NT \l__enumext_check_ans_bool
2146 {
2147   \int_gincr:N \g__enumext_count_item_anskey_int
2148 }
2149 }

```

(End of definition for `__enumext_keyans_addto_seq:n` and `__enumext_keyans_addto_seq_link:.`)

10.25.4 Check for starred commands

`__enumext_keyans_check_ans:nn`

The function `__enumext_keyans_check_ans:nn` performs an extra check for the `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.

```

2150 \cs_new_protected:Npn \__enumext_keyans_check_ans:nn #1 #2
2151 {
2152   \tl_if_empty:NTF \g__enumext_check_ans_item_tl
2153   {
2154     \msg_warning:nnnn { enumext } { missing-starred }{ #1 }{ #2 }
2155   }
2156   { \tl_gclear:N \g__enumext_check_ans_item_tl }
2157 }

```

(End of definition for `__enumext_keyans_check_ans:nn`.)

10.25.5 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_` `\l__enumext_store_name_tl` `_prop` for `show-pos` key.

```

2158 \cs_new_protected:Npn \__enumext_keyans_show_left:n #1
2159 {
2160   \tl_if_novalue:nF { #1 }
2161   {
2162     \tl_set:Ne \l__enumext_keyans_item_opt_tl { #1 }
2163   }
2164   \bool_if:NT \l__enumext_show_answer_bool
2165   {
2166     \__enumext_keyans_show_ans:
2167   }
2168   \bool_if:NT \l__enumext_show_position_bool
2169   {
2170     \__enumext_keyans_show_pos:
2171   }
2172 }
2173 \cs_new_protected:Nn \__enumext_keyans_show_item_opt:
2174 {
2175   \tl_if_empty:NF \l__enumext_keyans_item_opt_tl
2176   {
2177     \bool_lazy_or:nnT
2178     { \bool_if_p:N \l__enumext_show_answer_bool }
2179     { \bool_if_p:N \l__enumext_show_position_bool }
2180     {
2181       \__enumext_keyans_wrapper_opt:n { \l__enumext_keyans_item_opt_tl } \c_space_tl
2182     }
2183   }

```



```

2184   }
2185   \cs_new_protected:Nn \__enumext_keyans_show_ans:
2186   {
2187     \tl_put_left:Nn \l__enumext_label_v_tl
2188     {
2189       \__enumext_print_keyans_box:NN \l__enumext_labelwidth_i_dim \l__enumext_labelsep_i_dim
2190     }
2191   }
2192   \cs_new_protected:Nn \__enumext_keyans_show_pos:
2193   {
2194     \int_compare:nNnTF { \l__enumext_keyans_pic_level_int } = { 1 }
2195     {
2196       \tl_set:Ne \l__enumext_mark_answer_sym_tl
2197       {
2198         \group_begin:
2199         \exp_not:N \normalfont
2200         \exp_not:N \footnotesize [ \int_eval:n
2201         {
2202           \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop }
2203         }
2204         ]
2205         \group_end:
2206       }
2207     }
2208     {
2209       \tl_set:Ne \l__enumext_mark_answer_sym_tl
2210       {
2211         \group_begin:
2212         \exp_not:N \normalfont
2213         \exp_not:N \footnotesize [ \int_eval:n
2214         {
2215           \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop } + 1
2216         }
2217         ]
2218         \group_end:
2219       }
2220     }
2221     \tl_put_left:Nn \l__enumext_label_v_tl
2222     {
2223       \__enumext_print_keyans_box:NN
2224       \l__enumext_labelwidth_i_dim
2225       \l__enumext_labelsep_i_dim
2226     }
2227   }

```

(End of definition for `__enumext_keyans_show_left:n` and others.)

10.26 Setting `item-sym*` and `item-pos*` keys

In order to have a cleaner implementation of `\item*` 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* Define and set item-sym* and item-pos* keys for enumext and enumext*.
item-pos*
2228 \cs_set_protected:Npn \__enumext_tmp:nn #1 #2
2229 {
2230   \keys_define:nn { enumext / #1 }
2231   {
2232     item-sym* .tl_set:c = { \l__enumext_item_symbol_#2_tl },
2233     item-sym* .value_required:n = true,
2234     item-sym* .initial:n = { $\star$ },
2235     item-pos* .dim_set:c = { \l__enumext_item_symbol_sep_#2_dim },
2236     item-pos* .value_required:n = true,
2237   }
2238 }
2239 \clist_map_inline:nn
2240 {
2241   {level-1}{i}, {level-2}{ii}, {level-3}{iii}, {level-4}{iv}, {enumext*}{vii}
2242 }
2243 { \__enumext_tmp:nn #1 }

```

(End of definition for `item-sym*` and `item-pos*`.)

10.27 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 with the `mini-env` key and 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](#).

```

2244 \cs_new_protected:Nn \__enumext_footnotetext:nn
2245 {
2246   \footnotetext[#1]{#2}
2247 }
2248 \cs_new_protected:Nn \__enumext_renew_footnote:
2249 {
2250   \seq_gclear:N \g__enumext_footnote_arg_seq
2251   \seq_gclear:N \g__enumext_footnote_int_seq
2252   \RenewDocumentCommand \footnote { o +m }
2253   {
2254     \tl_if_novalue:nTF {##1}
2255     {
2256       \stepcounter{footnote}
2257       \int_gset_eq:Nc \g__enumext_footnote_int { c@footnote }
2258     }
2259     {
2260       \int_gset:Nn \g__enumext_footnote_int { ##1 }
2261     }
2262     \footnotemark [ \g__enumext_footnote_int ]
2263     \seq_gput_right:Nn \g__enumext_footnote_arg_seq { ##2 }
2264     \seq_gput_right:NV \g__enumext_footnote_int_seq \g__enumext_footnote_int
2265   }
2266 }
2267 \cs_new_protected:Nn \__enumext_print_footnote:
2268 {
2269   \seq_if_empty:NF \g__enumext_footnote_int_seq
2270   {
2271     \seq_map_pairwise_function:NNN
2272     \g__enumext_footnote_int_seq
2273     \g__enumext_footnote_arg_seq
2274     \__enumext_footnotetext:nn
2275   }
2276 }

```

(End of definition for `__enumext_footnotetext:nn`, `__enumext_renew_footnote:`, and `__enumext_print_footnote:`)

10.28 Redefining `\item` command

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.

10.28.1 The `\item` command in `enumext`

```

\__enumext_default_item:n

```

The `\item` and `\item[custom]` commands work in the usual way on `enumext`.

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_ans_bool` set by the key `check-ans`, set the boolean variable `\l__enumext_wrap_label_X_bool` to “true” and execute `__enumext_item_std:w`.

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.

The boolean variable `\l__enumext_wrap_label_X_bool` is used by the function `__enumext_make_label:` (§10.29).

```

2277 \cs_new_protected:Npn \__enumext_default_item:n #1
2278 {
2279   \tl_if_novalue:nTF {#1}
2280   {
2281     \bool_if:NT \l__enumext_check_ans_bool
2282     {
2283       \int_gincr:N \g__enumext_count_item_number_int
2284     }
2285     \bool_set_true:c { l__enumext_wrap_label_ \__enumext_level: _bool }
2286     \__enumext_item_std:w \tl_use:c { l__enumext_fake_item_indent_ \__enumext_level: _tl }
2287   }
2288   {
2289     \bool_set_eq:cc
2290     { l__enumext_wrap_label_ \__enumext_level: _bool }

```

```

2291         { \__enumext_wrap_label_opt_ \__enumext_level: _bool }
2292         \__enumext_item_std:w [#1] \tl_use:c { \__enumext_fake_item_indent_ \__enumext_level: _tl
2293     }
2294 }

```

(End of definition for __enumext_default_item:n.)

__enumext_starred_item:nn

The `\item*`, `\item*[\langle symbol \rangle]` and `\item*[\langle symbol \rangle][\langle offset \rangle]` works like the numbered `\item`, but placing a `[\langle symbol \rangle]` to the “left” of the `\label` separated from it by the value set by the `labelsep` key and can be *offset* using the second optional argument `[\langle offset \rangle]`.

#1: __enumext_item_symbol_X_tl

#2: __enumext_item_symbol_sep_X_dim

First we will make a copy of `__enumext_item_symbol_X_tl` which is set by the key `item-sym*` or passed as optional argument in the global variable `\g__enumext_item_symbol_tl`, followed by setting the variable `__enumext_item_symbol_sep_X_dim` set by the key `item*-sep` or by the second optional argument.

Then we will see the state of the variable `__enumext_check_ans_bool` set by the key `check-ans`, set the boolean variable `__enumext_wrap_label_X_bool` to “true” and execute `__enumext_item_std:w`.

In this function the optional argument of `__enumext_item_std:w` is omitted, we only want it to be numbered.

The boolean variable `__enumext_wrap_label_X_bool` and the vars `__enumext_item_symbol_sep_X_dim`, `\g__enumext_item_symbol_tl` are used by the function `__enumext_make_label:` (§10.29).

```

2295 \cs_new_protected:Npn \__enumext_starred_item:nn #1 #2
2296 {
2297     \tl_if_novalue:nF {#1}
2298     {
2299         \tl_set:cn { \__enumext_item_symbol_ \__enumext_level: _tl } {#1}
2300     }
2301     \tl_gset_eq:Nc \g__enumext_item_symbol_tl { \__enumext_item_symbol_ \__enumext_level: _tl }
2302     \tl_if_novalue:nTF {#2}
2303     {
2304         \dim_set_eq:cc
2305         { \__enumext_item_symbol_sep_ \__enumext_level: _dim }
2306         { \__enumext_labelsep_ \__enumext_level: _dim }
2307     }
2308     {
2309         \dim_set:cn { \__enumext_item_symbol_sep_ \__enumext_level: _dim } {#2}
2310     }
2311     \bool_if:NT \__enumext_check_ans_bool
2312     {
2313         \int_gincr:N \g__enumext_count_item_number_int
2314     }
2315     \bool_set_true:c { \__enumext_wrap_label_ \__enumext_level: _bool }
2316     \__enumext_item_std:w \tl_use:c { \__enumext_fake_item_indent_ \__enumext_level: _tl }
2317 }

```

(End of definition for __enumext_starred_item:nn.)

__enumext_redefine_item:

The function `__enumext_redefine_item:` will redefine the `\item` command in the `enumext` environment for the internal mechanism of check-answers for `check-ans` key and adding the starred `\item*` version.

This function is passed to `__enumext_list_arg_two_X:` which is used in the definition of the `enumext` environment (§10.31).

```

2318 \cs_new_protected:Npn \__enumext_redefine_item:
2319 {
2320     \RenewDocumentCommand \item { s o o }
2321     {
2322         \bool_if:nTF {##1}
2323         {
2324             \__enumext_starred_item:nn {##2} {##3}
2325         }
2326         { \__enumext_default_item:n {##2} }
2327     }
2328 }

```

(End of definition for __enumext_redefine_item:.)

10.28.2 The `\item` command in keyans

The `\item*` and `\item*[\langle content \rangle]` commands *store* the current $\langle label \rangle$ next to the $[\langle content \rangle]$ if it is present in the $\langle sequence \rangle$ and $\langle prop list \rangle$ defined by *save-ans* key.

`__enumext_keyans_default_item:n`

The function `__enumext_keyans_default_item:n` executes the original behavior of the `\item`.

```

2329 \cs_new_protected:Npn \__enumext_keyans_default_item:n #1
2330 {
2331   \tl_if_novalue:nTF { #1 }
2332   {
2333     \bool_set_true:N \__enumext_wrap_label_v_bool
2334     \__enumext_item_std:w \tl_use:N \__enumext_fake_item_indent_v_tl
2335   }
2336   {
2337     \bool_set_eq:NN \__enumext_wrap_label_v_bool \__enumext_wrap_label_opt_v_bool
2338     \__enumext_item_std:w [#1] \tl_use:N \__enumext_fake_item_indent_v_tl
2339   }
2340 }

```

(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 $\langle label \rangle$, 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 $\langle label \rangle$.

```

2341 \cs_new_protected:Npn \__enumext_keyans_starred_item:n #1
2342 {
2343   \tl_set_eq:NN \__enumext_keyans_tmpa_tl \__enumext_label_v_tl
2344   \__enumext_keyans_show_left:n { #1 }
2345   \bool_set_true:N \__enumext_wrap_label_v_bool
2346   \__enumext_item_std:w \tl_use:N \__enumext_fake_item_indent_v_tl \__enumext_keyans_show_item

```

Recover the original value of the current $\langle label \rangle$ and *store* it first in the $\langle prop list \rangle$ (including the optional argument), run the internal “*label and ref*” system if the *save-ref* key is active and finally *store* it in the $\langle sequence \rangle$.

```

2347   \tl_set_eq:NN \__enumext_label_v_tl \__enumext_keyans_tmpa_tl
2348   \__enumext_keyans_addto_prop:n { #1 }
2349   \__enumext_keyans_store_ref:
2350   \__enumext_keyans_addto_seq:n { #1 }
2351 }

```

(End of definition for `__enumext_keyans_starred_item:n`.)

`\item*`

`__enumext_keyans_redefine_item:`

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.

This function is passed to `__enumext_list_arg_two_v:` which is used in the definition of the *keyans* environment (§10.31).

```

2352 \cs_new_protected:Nn \__enumext_keyans_redefine_item:
2353 {
2354   \RenewDocumentCommand \item { s o }
2355   {
2356     \bool_if:nTF {##1}
2357     {
2358       \peek_remove_spaces:n
2359       {
2360         \__enumext_keyans_starred_item:n {##2}
2361       }
2362     }
2363     {
2364       \__enumext_keyans_default_item:n {##2}
2365     }
2366   }
2367 }

```

(End of definition for `\item*` and `__enumext_keyans_redefine_item:`. This function is documented on page 11.)

10.29 Redefining `\makelabel` command

Redefine `\makelabel` for the keys *align*, *font*, *wrap-label*, *wrap-label** and `\item*` for *enumext* and *keyans* environments.

10.29.1 Redefining \makeLabel for enumext

`__enumext_item_starred:` The function `__enumext_item_starred:` will be responsible for executing `\item*` for the `enumext` environment.

```
2368 \cs_new_protected:Nn \__enumext_item_starred:
2369 {
2370   \tl_if_empty:cF { \__enumext_item_symbol_ \__enumext_level: _tl }
2371   {
2372     \mode_leave_vertical:
2373     \skip_horizontal:n { -\dim_use:c { \__enumext_item_symbol_sep_ \__enumext_level: _dim } }
2374     \makebox[ 0pt ][ r ]{ \g__enumext_item_symbol_tl }
2375     \skip_horizontal:n { \dim_use:c { \__enumext_item_symbol_sep_ \__enumext_level: _dim } }
2376   }
2377 }
```

(End of definition for `__enumext_item_starred:`)

`__enumext_make_label:` The function `__enumext_make_label:` redefine `\makeLabel` for the `enumext` environment. This function is passed to `__enumext_list_arg_two_X:` which is used in the definition of the `enumext` environment (§10.31).

```
2378 \cs_new_protected:Nn \__enumext_make_label:
2379 {
2380   \RenewDocumentCommand \makeLabel { m }
2381   {
2382     \tl_use:c { \__enumext_label_fill_left_ \__enumext_level: _tl }
2383     \tl_use:c { \__enumext_label_font_style_ \__enumext_level: _tl }
2384     \bool_if:cTF { \__enumext_wrap_label_ \__enumext_level: _bool }
2385     {
2386       \__enumext_item_starred:
2387       \use:c { __enumext_wrapper_label_ \__enumext_level: :n } { ##1 }
2388     }
2389     { ##1 }
2390     \tl_use:c { \__enumext_label_fill_right_ \__enumext_level: _tl }
2391     \tl_gclear:N \g__enumext_item_symbol_tl
2392   }
2393 }
```

(End of definition for `__enumext_make_label:`)

10.29.2 Redefining \makeLabel for keyans

`__enumext_keyans_make_label:` The function `__enumext_keyans_make_label:` redefine `\makeLabel` for `keyans` environment. This function is passed to `__enumext_list_arg_two_v:` which is used in the definition of the `keyans` environment (§10.31).

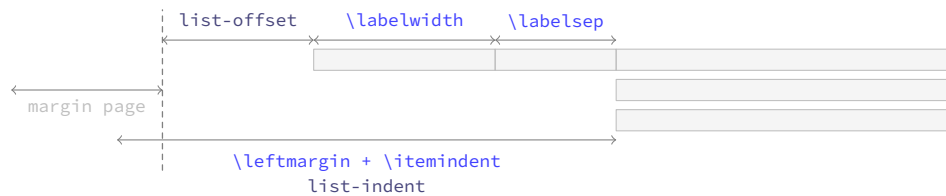
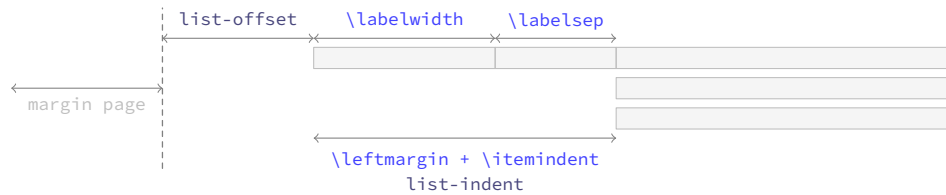
```
2394 \cs_new_protected:Nn \__enumext_keyans_make_label:
2395 {
2396   \RenewDocumentCommand \makeLabel { m }
2397   {
2398     \tl_use:N \l__enumext_label_fill_left_v_tl
2399     \tl_use:N \l__enumext_label_font_style_v_tl
2400     \bool_if:NTF \l__enumext_wrap_label_v_bool
2401     {
2402       \__enumext_wrapper_label_v:n { ##1 }
2403     }
2404     { ##1 }
2405     \tl_use:N \l__enumext_label_fill_right_v_tl
2406   }
2407 }
```

(End of definition for `__enumext_keyans_make_label:`)

10.30 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.

`__enumext_calc_hspace:NNNNNNN` The function `__enumext_calc_hspace:NNNNNNN` takes seven arguments to be able to determine horizontal spaces for all list environment:

Figure 9: Representation of standard horizontal lengths in `list` environment.Figure 10: Representation of horizontal lengths concept in list in `enumext`.

```

#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 (§10.31).

```

2408 \cs_new_protected:Npn \__enumext_calc_hspace:NNNNNN #1 #2 #3 #4 #5 #6 #7
2409 {
2410   \dim_compare:nNnT { #1 } < { \c_zero_dim }
2411   {
2412     \msg_warning:nnnV { enumext } { width-non-positive } { labelwidth } { #1 }
2413     \dim_set:Nn #1 { \dim_abs:n { #1 } }
2414   }
2415   \dim_compare:nNnT { #2 } < { \c_zero_dim }
2416   {
2417     \msg_warning:nnnV { enumext } { width-negative } { labelsep } { #2 }
2418     \dim_set:Nn #2 { \dim_abs:n { #2 } }
2419   }

```

If no value has been passed to the `labelwidth` and `labelsep` keys we set the default values for `\l__enumext_leftmargin_tmp_X_dim`.

```

2420   \bool_if:nF #7 { \dim_set:Nn #4 { #1 + #2 } }

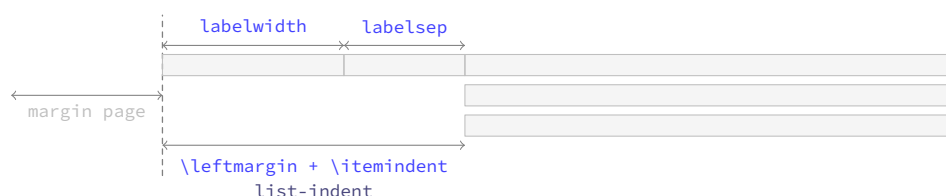
```

We now analyze the cases and set the values for `\leftmargin` and `\itemindent`.

```

2421   \dim_compare:nNnTF { #4 } < { \c_zero_dim }
2422   {
2423     \dim_set:Nn #6 { #1 + #2 - #4 }
2424     \dim_set:Nn #5 { #1 + #2 + #3 - #6 }
2425   }
2426   {
2427     \dim_compare:nNnT { #4 } = { #1 + #2 }
2428     { \dim_set:Nn #6 { \c_zero_dim } }
2429     \dim_compare:nNnT { #4 } < { #1 + #2 }
2430     { \dim_set:Nn #6 { #1 + #2 - #4 } }
2431     \dim_compare:nNnT { #4 } > { #1 + #2 }
2432     {
2433       \dim_set:Nn #6 { -#1 - #2 + #4 }
2434       \dim_set:Nn #6 { #6*-1 }
2435     }

```

Figure 11: Default horizontal lengths in `enumext`.

```

2436         \dim_set:Nn #5 { #1 + #2 + #3 - #6 }
2437     }
2438 }
2439 \cs_generate_variant:Nn \__enumext_calc_hspace:NNNNNNN { cccccc }

```

(End of definition for __enumext_calc_hspace:NNNNNNN.)

10.31 Setting second argument of the lists

At this point of the code we have already programmed the necessary tools to create a custom `list` environment, remember that the function `__enumext_start_list:n` 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`.

In this function for the second list argument we will implement the keys `start`, `resume` and `show-length` together with the redefinition of `\item` for `enumext` and `keyans` environments.

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.

```

2440 \cs_set_protected:Npn \__enumext_tmp:n #1
2441 {
2442     \cs_new_protected:cpn { __enumext_list_arg_two_#1: }
2443     {
2444         \__enumext_calc_hspace:ccccc
2445         { \__enumext_labelwidth_#1_dim } { \__enumext_labelsep_#1_dim }
2446         { \__enumext_listoffset_#1_dim } { \__enumext_leftmargin_tmp_#1_dim }
2447         { \__enumext_leftmargin_#1_dim } { \__enumext_itemindent_#1_dim }
2448         { \__enumext_leftmargin_tmp_#1_bool }
2449         \clist_map_inline:nn
2450         { labelsep, labelwidth, itemindent, leftmargin, rightmargin, listparindent }
2451         { \dim_set_eq:cc {###1} { \__enumext_###1_#1_dim } }
2452         \clist_map_inline:nn { topsep, parsep, partopsep, itemsep }
2453         { \skip_set_eq:cc {###1} { \__enumext_###1_#1_skip } }
2454         \usecounter { enumX#1 }
2455         \setcounter { enumX#1 } { \int_eval:n { \int_use:c { \__enumext_start_#1_int } - 1 } }
2456         \str_if_eq:nnTF {#1} { v }
2457         {
2458             \__enumext_keyans_redefine_item:
2459             \__enumext_keyans_make_label:
2460             \__enumext_keyans_fake_item:
2461             \bool_if:cT { \__enumext_show_length_#1_bool }
2462             {
2463                 \msg_term:nnnn { enumext } { list-lengths-not-nested } { v } { keyans }
2464             }
2465         }
2466         {
2467             \__enumext_redefine_item:
2468             \__enumext_make_label:
2469             \__enumext_use_key_ref:
2470             \__enumext_fake_item:
2471             \bool_if:cT { \__enumext_show_length_#1_bool }
2472             {
2473                 \msg_term:nnne { enumext } { list-lengths } {#1} { \int_use:N \__enumext_level_#1_int }
2474             }
2475         }
2476     }
2477 }
2478 \clist_map_inline:nn { i, ii, iii, iv, v } { \__enumext_tmp:n {#1} }

```

(End of definition for __enumext_list_arg_two_i: and others.)

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.

```

2479 \cs_set_protected:Npn \__enumext_tmp:n #1
2480 {
2481     \cs_new_protected:cpn { __enumext_list_arg_two_#1: }
2482     {
2483         \__enumext_calc_hspace:ccccc
2484         { \__enumext_labelwidth_#1_dim } { \__enumext_labelsep_#1_dim }
2485         { \__enumext_listoffset_#1_dim } { \__enumext_leftmargin_tmp_#1_dim }

```



```

2486     { \__enumext_leftmargin_#1_dim } { \__enumext_itemindent_#1_dim }
2487     { \__enumext_leftmargin_tmp_#1_bool }
2488 \clist_map_inline:nn
2489     { labelsep, labelwidth, itemindent, leftmargin, rightmargin, listparindent }
2490     { \dim_set_eq:cc {####1} { \__enumext_####1_#1_dim } }
2491 \clist_map_inline:nn { topsep, parsep, partopsep, itemsep }
2492     { \skip_set_eq:cc {####1} { \__enumext_####1_#1_skip } }
2493 \skip_set_eq:Nc \parsep { \__enumext_itemsep_#1_skip }
2494 \skip_zero:N \partopsep
2495 \usecounter { enumX#1 }
2496 \setcounter { enumX#1 } { \int_eval:n { \int_use:c { \__enumext_start_#1_int } - 1 } }
2497 \__enumext_use_key_ref_h:
2498 \str_if_eq:nnTF {#1} { vii }
2499     {
2500         \__enumext_fake_item_vii:
2501         \bool_if:cT { \__enumext_show_length_vii_bool }
2502             { \msg_term:nnnn { enumext } { list-lengths-not-nested } { vii } { enumext* } }
2503     }
2504     {
2505         \__enumext_fake_item_viii:
2506         \bool_if:cT { \__enumext_show_length_#1_bool }
2507             { \msg_term:nnnn { enumext } { list-lengths-not-nested } { #1 } { keyans* } }
2508     }
2509 }
2510 }
2511 \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:.)

10.32 The environment enumext

`enumext` We create the `enumext` environment based on `list` environment by levels.

```

2512 \NewDocumentEnvironment{enumext}{0}{ }
2513 {
2514     \__enumext_safe_exec:
2515     \__enumext_parse_keys:n {#1}
2516     \__enumext_before_list:
2517     \__enumext_start_store_level:
2518     \__enumext_start_list:nn
2519     { \tl_use:c { \__enumext_label_ \__enumext_level: _tl } }
2520     {
2521         \use:c { __enumext_list_arg_two_ \__enumext_level: : }
2522         \__enumext_before_keys_exec:
2523     }
2524     \__enumext_after_args_exec:
2525 }
2526 {
2527     \__enumext_stop_list:
2528     \__enumext_stop_store_level:
2529     \__enumext_after_list:
2530 }

```

(End of definition for enumext. This function is documented on page 4.)

`__enumext_safe_exec:` First check the maximum nesting level for the `enumext` environment and set the state of the booleans vars `\l__enumext_standar_bool` and `\l__enumext_standar_first_bool` to “true”, the latter only if the environment is NOT nested in the `enumext*` environment.

```

2531 \cs_new_protected:Nn \__enumext_safe_exec:
2532 {
2533     \__enumext_current_env_set_bool:
2534     \int_incr:N \__enumext_level_int
2535     \int_compare:nNnT { \__enumext_level_int } > { 4 }
2536         { \msg_fatal:nn { enumext } { list-too-deep } }
2537     \bool_set_true:N \l__enumext_standar_bool
2538     \bool_lazy_all:nT
2539     {
2540         { \bool_if_p:N \g__enumext_standar_bool }
2541         { \int_compare_p:nNn { \__enumext_level_int } = { 1 } }
2542         { \int_compare_p:nNn { \__enumext_level_h_int } = { 0 } }
2543     }
2544     {
2545         \typeout{[[ON-FIRST-LEVEL-ENUMEXT-NOT-NESTED]]}

```

```

2546         \bool_set_true:N \l__enumext_standar_level_one_bool
2547     }
2548 }

```

(End of definition for `__enumext_safe_exec:`)

`__enumext_parse_keys:n`

Parse [`⟨key = val⟩`] by levels in `enumext`. If the variable `\l__enumext_store_active_bool` is true it will call the function `__enumext_parse_store_keys:n` and reprocess the `⟨keys⟩` to pass them to the storage sequence.

```

2549 \cs_new_protected:Npn \__enumext_parse_keys:n #1
2550 {
2551     \tl_if_novalue:nF {#1}
2552     {
2553         \str_clear:N \l__enumext_series_str
2554         \int_compare:nNnTF { \l__enumext_level_int } = { 1 }
2555         {
2556             \keys_set:nn { enumext / level-1 } {#1}
2557             \__enumext_parse_series_name:n {#1}
2558         }
2559         {
2560             \exp_args:Ne \keys_set:nn
2561                 { enumext / level-\int_use:N \l__enumext_level_int } {#1}
2562         }
2563         \bool_if:NT \l__enumext_store_active_bool
2564         {
2565             \__enumext_parse_store_keys:n {#1}
2566         }
2567     }
2568 }

```

(End of definition for `__enumext_parse_keys:n`)

`__enumext_parse_store_keys:n`

The function `__enumext_parse_store_keys:n` searches for the values of the `columns` and `columns-sep` keys in the optional arguments per-level in `enumext` environment as long as the starred versions of the `columns*` and `columns-sep*` keys are not active. The captured values are stored in the variable `\l__enumext_store_opt_X_tl` which is used by the function `__enumext_store_level_open:`.

```

2569 \cs_new_protected:Npn \__enumext_parse_store_keys:n #1
2570 {
2571     \bool_if:cF { \l__enumext_store_columns_ \__enumext_level: _bool }
2572     {
2573         \regex_match:nnT { \b columns\b } {#1}
2574         {
2575             \int_set_eq:cc
2576                 { \l__enumext_store_columns_ \__enumext_level: _int }
2577                 { \l__enumext_columns_ \__enumext_level: _int }
2578             \tl_put_right:ce { \l__enumext_store_opt_ \__enumext_level: _tl }
2579                 {
2580                     columns = \exp_not:v { \l__enumext_store_columns_ \__enumext_level: _int },
2581                 }
2582         }
2583     }
2584     \bool_if:cF { \l__enumext_store_columns_sep_ \__enumext_level: _bool }
2585     {
2586         \regex_match:nnT { \b columns-sep\b } {#1}
2587         {
2588             \dim_set_eq:cc
2589                 { \l__enumext_store_columns_sep_ \__enumext_level: _dim }
2590                 { \l__enumext_columns_sep_ \__enumext_level: _dim }
2591             \tl_put_right:ce { \l__enumext_store_opt_ \__enumext_level: _tl }
2592                 {
2593                     columns-sep = \exp_not:v { \l__enumext_store_columns_sep_ \__enumext_level: _dim }
2594                 }
2595         }
2596     }
2597 }

```

(End of definition for `__enumext_parse_store_keys:n`)

`__enumext_start_store_level:`

The `__enumext_start_store_level:` and `__enumext_stop_store_level:` functions activate the level saving mechanism for storage in `⟨sequence⟩` of the `\anskey` command.

`__enumext_stop_store_level:`

If `enumext` are nested in `enumext*` add `__enumext_store_level_open:` to preserve the stored structure.

```

2598 \cs_new_protected:Nn \__enumext_start_store_level:
2599 {
2600   \bool_lazy_all:nT
2601   {
2602     { \bool_if_p:N \l__enumext_store_active_bool }
2603     { \bool_not_p:n { \l__enumext_keyans_env_bool } }
2604     { \bool_not_p:n { \g__enumext_starred_bool } }
2605   }
2606   {
2607     \int_compare:nNnT { \l__enumext_level_int } > { 1 }
2608     {
2609       \bool_set_true:c { \l__enumext_store_upper_level_ \__enumext_level: _bool }
2610       \__enumext_store_level_open:
2611     }
2612   }
2613   \bool_lazy_all:nT
2614   {
2615     { \bool_if_p:N \l__enumext_store_active_bool }
2616     { \bool_not_p:n { \l__enumext_keyans_env_bool } }
2617     { \bool_if_p:N \g__enumext_starred_bool }
2618   }
2619   {
2620     \int_compare:nNnT { \l__enumext_level_int } > { 0 }
2621     {
2622       \bool_set_true:c { \l__enumext_store_upper_level_ \__enumext_level: _bool }
2623       \__enumext_store_level_open:
2624     }
2625   }
2626 }
2627 \cs_new_protected:Nn \__enumext_stop_store_level:
2628 {
2629   \bool_if:cT { \l__enumext_store_upper_level_ \__enumext_level: _bool }
2630   {
2631     \__enumext_store_level_close:
2632   }
2633 }

```

(End of definition for `__enumext_start_store_level:` and `__enumext_stop_store_level:`.)

`__enumext_before_list:` The function `__enumext_before_list:` 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.

```

2634 \cs_new_protected:Nn \__enumext_before_list:
2635 {
2636   \__enumext_vspace_above:
2637   \__enumext_before_args_exec:

```

The function `__enumext_check_ans_exec:` will handle the check answer mechanism, which will be activated with the `check-ans` key.

```

2638   \__enumext_check_ans_exec:

```

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.

```

2639   \dim_compare:nNnT
2640   { \dim_use:c { \l__enumext_minipage_right_ \__enumext_level: _dim } } > { \c_zero_dim }
2641   {
2642     \dim_set:cn { \l__enumext_minipage_left_ \__enumext_level: _dim }
2643     {
2644       \linewidth
2645       - \dim_use:c { \l__enumext_minipage_right_ \__enumext_level: _dim }
2646       - \dim_use:c { \l__enumext_minipage_hsep_ \__enumext_level: _dim }
2647     }

```

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*.

```

2648     \bool_set_true:c { \__enumext_minipage_active_ \__enumext_level: _bool }
2649     \int_gincr:N \g__enumext_minipage_stat_int
2650     \__enumext_mini_addvspace:
2651     \nointerlineskip\noindent
2652     \begin{\__enumext_mini_env*}
2653     { \dim_use:c { \__enumext_minipage_left_ \__enumext_level: _dim } }
2654     }
2655     \__enumext_multicols_start:
2656     }

```

(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=opt` and set the value of `\multicolsep` equal to zero and leave `\columnseprule` equal to zero for inner levels.

```

2657 \cs_new_protected:Nn \__enumext_multicols_start:
2658 {
2659     \int_compare:nNt
2660     { \int_use:c { \__enumext_columns_ \__enumext_level: _int } } > { 1 }
2661     {
2662         \dim_compare:nNt
2663         { \dim_use:c { \__enumext_columns_sep_ \__enumext_level: _dim } } = { \c_zero_dim }
2664         {
2665             \dim_set:cn { \__enumext_columns_sep_ \__enumext_level: _dim }
2666             {
2667                 ( \dim_use:c { \__enumext_labelwidth_ \__enumext_level: _dim }
2668                   + \dim_use:c { \__enumext_labelsep_ \__enumext_level: _dim }
2669                   ) / \int_use:c { \__enumext_columns_ \__enumext_level: _int }
2670                   - \dim_use:c { \__enumext_listoffset_ \__enumext_level: _dim }
2671                 )
2672             }
2673             \dim_set_eq:Nc \columnsep { \__enumext_columns_sep_ \__enumext_level: _dim }
2674             \skip_zero:N \multicolsep
2675             \int_compare:nNt { \__enumext_level_int } > { 1 }
2676             {
2677                 \dim_zero:N \columnseprule
2678             }

```

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.

```

2679     \bool_if:cF { \__enumext_minipage_active_ \__enumext_level: _bool }
2680     {
2681         \__enumext_multi_addvspace:
2682     }
2683     \raggedcolumns
2684     \begin{multicols}{ \int_use:c { \__enumext_columns_ \__enumext_level: _int } }
2685     }
2686     }

```

(End of definition for `__enumext_multicols_start:`)

`__enumext_multicols_stop:` The function `__enumext_multicols_stop:` will stop the `multicols` environment. If the boolean variable `__enumext_minipage_active_X_bool` is false (not nested in `__enumext_mini_env*`) we will apply our “*vertical adjust*” spacing.

```

2687 \cs_new_protected:Nn \__enumext_multicols_stop:
2688 {
2689     \int_compare:nNt
2690     { \int_use:c { \__enumext_columns_ \__enumext_level: _int } } > { 1 }
2691     {
2692         \end{multicols}
2693         \bool_if:cF { \__enumext_minipage_active_ \__enumext_level: _bool }
2694         {
2695             \par\addvspace{ \skip_use:c { \__enumext_multicols_below_ \__enumext_level: _skip } }
2696         }
2697     }

```

If the `check-ans` key is active, we set the boolean variable `\g__enumext_check_ans_show_bool` to true and copy the stored name to the variable `\g__enumext_store_name_tl`. These variables will be used by the function `__enumext_after_env:n` to display the result of the internal check answer mechanism in the terminal.

```

2698   \bool_lazy_and:nnT
2699   { \bool_if_p:N \l__enumext_check_ans_bool }
2700   { \bool_not_p:n { \g__enumext_starred_bool } }
2701   {
2702     \bool_gset_true:N \g__enumext_check_ans_show_bool
2703     \tl_gset:NV \g__enumext_store_name_tl \l__enumext_store_name_tl
2704   }
2705 }

```

(End of definition for `__enumext_multicols_stop:`.)

`__enumext_after_list:` The function `__enumext_after_list:` will 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.

```

2706 \cs_new_protected:Nn \__enumext_after_list:
2707 {
2708   \bool_if:cTF { \l__enumext_minipage_active_ \__enumext_level: _bool }
2709   {
2710     \int_compare:nNnT { \g__enumext_minipage_stat_int } = { 1 }
2711     {
2712       \msg_warning:nn { enumext } { missing-miniright }
2713       \miniright
2714     }
2715     \int_gzero:N \g__enumext_minipage_stat_int
2716     \end{__enumext_mini_env*}
2717     \par\addvspace { \l__enumext_minipage_after_skip }
2718   }
2719   { \__enumext_multicols_stop: }

```

Now apply the `{\code}` handled by the `after` key together with the *vertical space* handled by the `below` key if they are present.

```

2720   \__enumext_after_stop_list:
2721   \__enumext_vspace_below:

```

Finally save the *current value* of the counter in `\g__enumext_resume_int` for the `resume` key. If the `save-ans` key is active, it will create the integer variable for the `resume` key, we only have to assign it the value of the current counter.

```

2722   \bool_set_false:N \l__enumext_standar_bool
2723   % Quizas aquí pueda incrementar directo y luego pasar todo con \g__enumext_resume_int
2724   \int_if_exist:cT { g__enumext_resume_ \l__enumext_store_name_tl _int }
2725   {
2726     \int_gset_eq:cN { g__enumext_resume_ \l__enumext_store_name_tl _int } \value{enumXi}
2727   }
2728   % Si se ejecuta la llave series, establecemos el valor solo cuando se ejecuta
2729   \tl_if_empty:NF \l__enumext_series_str
2730   {
2731     \int_gset_eq:cN { g__enumext_series_ \l__enumext_series_str _int } \value{enumXi}
2732   }
2733   % Si ejecutamos resume=name (\l__enumext_resume_name_tl), la variable entera ya está y la gua
2734   \tl_if_empty:NTF \l__enumext_resume_name_tl
2735   {
2736     \str_if_empty:NT \l__enumext_series_str
2737     {
2738       \int_gset_eq:NN \g__enumext_resume_int \value{enumXi}
2739     }
2740   }
2741   {
2742     \int_if_exist:cT { g__enumext_series_ \l__enumext_resume_name_tl _int }
2743     {
2744       \int_gset_eq:cN { g__enumext_series_ \l__enumext_resume_name_tl _int } \value{enumXi}
2745     }
2746   }
2747 }

```

(End of definition for `__enumext_after_list:`.)

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`.

```

2748 \__enumext_after_env:nn {enumext}
2749 {
2750   \int_compare:nNt { \l__enumext_level_int } = { 0 }
2751   {
2752     \bool_if:NT \g__enumext_check_ans_show_bool
2753     {
2754       \__enumext_check_ans_show:
2755     }
2756     \bool_gset_false:N \g__enumext_standar_bool
2757     \bool_gset_false:N \g__enumext_check_ans_show_bool
2758     \tl_gclear:N \g__enumext_store_name_tl
2759   }
2760 }

```

10.33 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.

```

2761 \NewDocumentEnvironment{keyans}{ 0 } { }
2762 {
2763   \__enumext_keyans_safe_exec:
2764   \__enumext_keyans_parse_keys:n {#1}
2765   \__enumext_before_list_v:
2766   \__enumext_start_list:nn
2767   { \tl_use:N \l__enumext_label_v_tl }
2768   {
2769     \__enumext_list_arg_two_v:
2770     \__enumext_before_keys_exec_v:
2771   }
2772   \__enumext_after_args_exec_v:
2773 }
2774 {
2775   \__enumext_keyans_check_ans:nn { item } { keyans }
2776   \__enumext_stop_list:
2777   \__enumext_after_list_v:
2778 }

```

(End of definition for `keyans`. This function is documented on page 10.)

`__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.

```

2779 \cs_new_protected:Nn \__enumext_keyans_safe_exec:
2780 {
2781   \bool_if:NF \l__enumext_store_active_bool
2782   {
2783     \msg_error:nnnn { enumext } { wrong-place } { keyans } { save-ans }
2784   }
2785   \int_incr:N \l__enumext_keyans_level_int
2786   \bool_set_true:N \l__enumext_keyans_env_bool
2787   % Set false for interfering with enumext nested in keyans (yes, its possible and crayze)
2788   \bool_set_false:N \l__enumext_store_active_bool
2789   \int_compare:nNt { \l__enumext_keyans_level_int } > { 1 }
2790   {
2791     \msg_error:nn { enumext } { keyans-nested }
2792   }
2793   \int_compare:nNt { \l__enumext_level_int } > { 1 }
2794   {
2795     \msg_error:nn { enumext } { keyans-wrong-level }
2796   }
2797 }

```

(End of definition for `__enumext_keyans_safe_exec:`.)

`__enumext_keyans_parse_keys:n` Parse [*key* = *val*] for *keyans* environment.

```
2798 \cs_new_protected:Npn \__enumext_keyans_parse_keys:n #1
2799 {
2800   \keys_set:nn { enumext / keyans } {#1}
2801 }
```

(End of definition for `__enumext_keyans_parse_keys:n`.)

`__enumext_before_list_v:` The function `__enumext_before_list_v:` will add the *vertical spacing* above the environment if the *above* key is active next to the *code* defined by the *before* key if it is active.

```
2802 \cs_new_protected:Nn \__enumext_before_list_v:
2803 {
2804   \__enumext_vspace_above_v:
2805   \__enumext_before_args_exec_v:
```

When the *mini-env* key is active it will set the value of the `\l__enumext_minipage_right_v_dim` to be the *width* of the `__enumext_mini_env*` environment on the *left side*, using this value together with the value of the `\l__enumext_minipage_hsep_v_dim` set by the *mini-sep* key, the value of `\l__enumext_minipage_left_v_dim` will be set, which will be the *width* of `__enumextt_mini_env*` environment on the *right side*, always having `\linewidth` as the maximum width between them.

```
2806   \dim_compare:nNnT { \l__enumext_minipage_right_v_dim } > { \c_zero_dim }
2807   {
2808     \dim_set:Nn \l__enumext_minipage_left_v_dim
2809     {
2810       \linewidth - \l__enumext_minipage_right_v_dim - \l__enumext_minipage_hsep_v_dim
2811     }
2812 }
```

The boolean variable `\l__enumext_minipage_active_v_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_keyans_mini_addvspace:` is called and the `__enumext_mini_env*` environment on *left side* will be initialized followed by the *vertical spacing* `\l__enumext_minipage_left_skip`. Here we use the plain TeX macro `\nointerlineskip` to prevent baseline “glue” being added between the next pair of boxes in a *vertical list*.

```
2812   \bool_set_true:N \l__enumext_minipage_active_v_bool
2813   \int_gincr:N \g__enumext_minipage_stat_int
2814   \__enumext_keyans_mini_addvspace:
2815   \nointerlineskip\noindent
2816   \begin{\__enumext_mini_env*}{ \l__enumext_minipage_left_v_dim }
2817 }
```

After these actions, the `__enumext_keyans_multicols_start:` function is called to handle the *multicols* environment.

```
2818   \__enumext_keyans_multicols_start:
2819 }
```

(End of definition for `__enumext_before_list_v:`.)

`__enumext_keyans_multicols_start:` The function `__enumext_keyans_multicols_start:` will start the *multicols* environment according to the value passed by the *columns* key.

```
2820 \cs_new_protected:Nn \__enumext_keyans_multicols_start:
2821 {
2822   \int_compare:nNnT { \l__enumext_columns_v_int } > { 1 }
2823   {
```

Set the default value for `\columnsep` when *columns-sep* key is *opt*.

```
2824   \dim_compare:nNnT { \l__enumext_columns_sep_v_dim } = { \c_zero_dim }
2825   {
2826     \dim_set:Nn \l__enumext_columns_sep_v_dim
2827     {
2828       (
2829         \l__enumext_labelwidth_v_dim + \l__enumext_labelsep_v_dim
2830       ) / \l__enumext_columns_v_int
2831       - \l__enumext_listoffset_v_dim
2832     }
2833   }
2834   \dim_set_eq:NN \columnsep \l__enumext_columns_sep_v_dim
```

Then we will set the value of `\multicolsep` and `\columnseprule` equal to zero (we do not want a vertical rule in this environment).

```
2835   \skip_zero:N \multicolsep
2836   \dim_zero:N \columnseprule
```


We will calculate the *vertical spacing* settings for the `multicols` environment using the function `__enumext_keyans_multi_addvspace`: and apply our “*vertical adjust spacing*”, then start the `multicols` environment.

```

2837         \bool_if:NF \l__enumext_minipage_active_v_bool
2838         {
2839             \__enumext_keyans_multi_addvspace:
2840         }
2841     \raggedcolumns
2842     \begin{multicols}{\l__enumext_columns_v_int }
2843 }
2844 }

```

(End of definition for `__enumext_keyans_multicols_start:`)

`__enumext_keyans_multicols_stop:`

The function `__enumext_keyans_multicols_stop:` will stop the `multicols` environment. If the boolean variable `\l__enumext_minipage_active_v_bool` is false (not nested in `__enumext_mini-env*`) we will apply our vertical “adjust” spacing.

```

2845 \cs_new_protected:Nn \__enumext_keyans_multicols_stop:
2846 {
2847     \int_compare:nNt { \l__enumext_columns_v_int } > { 1 }
2848     {
2849         \end{multicols}
2850         \bool_if:NF \l__enumext_minipage_active_v_bool
2851         {
2852             \par\addvspace{ \l__enumext_multicols_below_v_skip }
2853         }
2854     }
2855 }

```

(End of definition for `__enumext_keyans_multicols_stop:`)

`__enumext_after_list_v:`

The function `__enumext_after_list_v:` will check the state of the boolean variable `\l__enumext_minipage_active_v_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 vertical adjustment space `\l__enumext_minipage_after_skip`, otherwise we will close the `multicols` environment.

```

2856 \cs_new_protected:Nn \__enumext_after_list_v:
2857 {
2858     \bool_if:NTF \l__enumext_minipage_active_v_bool
2859     {
2860         \int_compare:nNt { \g__enumext_minipage_stat_int } = { 1 }
2861         {
2862             \msg_warning:nn { enumext } { missing-miniright }
2863             \miniright
2864         }
2865         \int_gzero:N \g__enumext_minipage_stat_int
2866         \end{__enumext_mini-env*}
2867         \par\addvspace{ \l__enumext_minipage_after_skip }
2868     }
2869     { \__enumext_keyans_multicols_stop: }

```

Finally we will apply the `{\code}` handled by the `after` key together with the *vertical space* handled by the `below` key if they are present.

```

2870     \bool_set_false:N \l__enumext_keyans_env_bool
2871     \__enumext_after_stop_list_v:
2872     \__enumext_vspace_below_v:
2873 }

```

(End of definition for `__enumext_after_list_v:`)

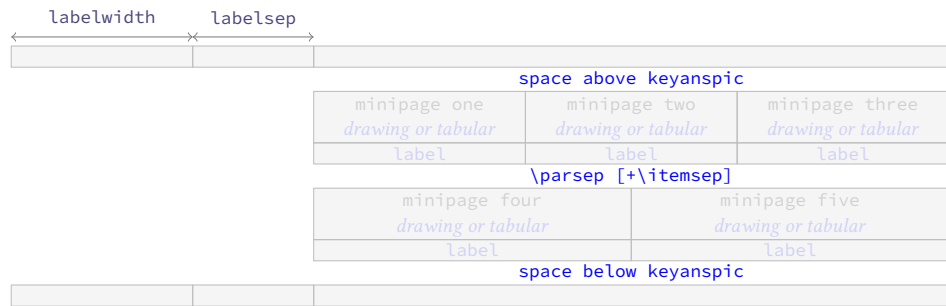
10.34 The environment `keyanspic` and `\anspic`

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.

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?](#).

Figure 12: Representation of the `keyanspic` spacing in `enumext`.

10.34.1 The command `\anspic`

`\anspic` The `\anspic` command take three arguments, the starred (*) versions `\anspic*` and `\anspic*[\langle content \rangle]` store the current `\label` next to the `[\langle content \rangle]` if it is present in the `\langle sequence \rangle` and `\langle prop list \rangle` defined by `save-ans` key. This command is used as a replacement for `\item` in the `keyanspic` environment.

```
2874 \NewDocumentCommand \anspic { s o +m }
2875 {
```

We check that the command is active in the `keyanspic` environment only if the `save-ans` key is present, otherwise we return an error.

```
2876   \bool_if:NF \l__enumext_store_active_bool
2877   {
2878     \msg_error:nnnn { enumext } { wrong-place } { keyanspic } { save-ans }
2879   }
2880   \int_compare:nNnT { \l__enumext_level_int } > { 1 }
2881   {
2882     \msg_error:nn { enumext } { keyanspic-wrong-level }
2883   }
2884   \int_compare:nNnT { \l__enumext_keyans_level_int } = { 1 }
2885   {
2886     \msg_error:nnnn { enumext } { command-wrong-place } { anspic } { keyans }
2887   }
```

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.

```
2888   \seq_put_right:Nn \l__enumext_keyans_pic_body_seq
2889   {
2890     \__enumext_keyans_anspic_code:nnn { #1 } { #2 } { #3 }
2891   }
2892 }
```

(End of definition for `\anspic`. This function is documented on page 12.)

`__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.

```
2893 \cs_new_protected:Nn \__enumext_keyans_anspic_code:nnn
2894 {
2895   \stepcounter { enumXvi }
2896   #3 \\\
2897   \bool_if:nT { #1 }
2898   {
2899     \__enumext_keyans_addto_prop:n { #2 }
2900     \__enumext_keyans_store_ref:
2901     \__enumext_keyans_addto_seq:n { #2 }
2902     \bool_lazy_or:nnT
2903     { \bool_if_p:N \l__enumext_show_answer_bool }
2904     { \bool_if_p:N \l__enumext_show_position_bool }
2905     {
2906       \tl_set_eq:NN \l__enumext_label_v_tl \l__enumext_label_vi_tl
2907       \__enumext_keyans_show_left:n { #2 }
2908       \tl_set_eq:NN \l__enumext_label_vi_tl \l__enumext_label_v_tl
2909     }
2910   }
2911   \tl_use:N \l__enumext_label_font_style_v_tl
2912   \__enumext_wrapper_label_v:n { \l__enumext_label_vi_tl } \__enumext_keyans_show_item_opt:
2913 }
```

(End of definition for `__enumext_keyans_anspic_code:nnn`.)

10.34.2 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.

```
2914 \NewDocumentEnvironment{keyanspic}{ o }
2915 {
2916   \__enumext_keyans_pic_safe_exec:
2917   \__enumext_start_list:nn
2918   { }
2919   {
2920     \__enumext_keyans_pic_arg_two:
2921   }
```

We apply the “adjusted” vertical spacing above the environment

```
2922 \vspace { \__enumext_keyans_pic_above_skip }
2923 }
```

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.

```
2924 {
2925   \tl_if_novalue:nTF { #1 }
2926   {
2927     \__enumext_keyans_pic_do:e { \seq_count:N \l__enumext_keyans_pic_body_seq }
2928   }
2929   { \__enumext_keyans_pic_do:n { #1 } }
2930   \__enumext_stop_list:
2931   \__enumext_keyans_check_ans:nn { anspic } { keyanspic }
2932   \setcounter { enumXvi } { 0 }
2933   \vspace { \__enumext_topsep_v_skip }
2934   %\bool_set_false:N \l__enumext_store_active_bool
2935 }
```

(End of definition for `keyanspic`. This function is documented on page 11.)

`__enumext_keyans_pic_safe_exec:` The function `__enumext_keyans_pic_safe_exec:` check nested and level position inside the `enumext` environment.

```
2936 \cs_new_protected:Nn \__enumext_keyans_pic_safe_exec:
2937 {
2938   \int_incr:N \l__enumext_keyans_pic_level_int
2939   \int_compare:nNt { \l__enumext_keyans_pic_level_int } > { 1 }
2940   {
2941     \msg_error:nn { enumext } { keyanspic-nested }
2942   }
2943 }
```

(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`.

```
2944 \cs_new_protected:Npn \__enumext_keyans_pic_skip_abs:N #1
2945 {
2946   \dim_compare:nNt { #1 } < { 0pt }
2947   { \skip_set:Nn #1 { -#1 } }
2948 }
```

(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.

```
2949 \cs_new_protected:Nn \__enumext_keyans_pic_arg_two:
2950 {
```

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.

```
2951   \bool_set_false:N \l__enumext_leftmargin_tmp_v_bool
2952   \__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.

```

2953 \skip_add:Nn \parsep { \itemsep }
2954 \dim_add:Nn \leftmargin { -\labelwidth - \labelsep }
2955 \dim_zero:N \labelwidth
2956 \dim_zero:N \listparindent
2957 \dim_zero:N \labelsep
2958 \skip_zero:N \partopsep
2959 \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 \TeX when not using the `\item` command.

```

2960 \__enumext_keyans_pic_skip_abs:N \parsep
2961 \skip_set:Nn \l__enumext_keyans_pic_above_skip
2962 {
2963   \box_dp:N \strutbox
2964   + \l__enumext_topsep_v_skip
2965   - \parsep
2966 }
2967 \__enumext_item_std:w \scan_stop:
2968 }

```

(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`.

```

2969 \cs_new_protected:Nn \__enumext_keyans_pic_do:n
2970 {
2971   \clist_map_function:nN { #1 } \__enumext_keyans_pic_row:n
2972 }
2973 \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 $\langle stored \rangle$ by `\anspic*` in the `\l__enumext_keyans_pic_body_seq` sequence inside them.

```

2974 \cs_new_protected:Nn \__enumext_keyans_pic_row:n
2975 {
2976   \dim_set:Nn \l__enumext_keyans_pic_width_dim { \linewidth / #1 }
2977   \int_set:Nn \l__enumext_keyans_pic_above_int { \l__enumext_keyans_pic_below_int }
2978   \int_set:Nn \l__enumext_keyans_pic_below_int { \l__enumext_keyans_pic_above_int + #1 }
2979   \int_step_inline:nnn
2980     { \l__enumext_keyans_pic_above_int + 1 }
2981     { \l__enumext_keyans_pic_below_int }
2982     {
2983       \__enumext_minipage:w [ b ]{ \l__enumext_keyans_pic_width_dim }
2984       \centering
2985       \seq_item:Nn \l__enumext_keyans_pic_body_seq { ##1 }
2986       \__enumext_endminipage:
2987     }
2988   \par
2989 }

```

(End of definition for `__enumext_keyans_pic_row:n`)

10.35 The environment `enumext*`

Generating horizontal list environments is NOT as simple as standard \TeX 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.

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 ($\langle number \rangle$).

10.35.1 Functions for item box width

`__enumext_starred_columns_set_vii:`

We set the default value for the width of the box containing the content of the items and create `\itemwidth` in a public form.

```

2990 \cs_new_protected:Nn \__enumext_starred_columns_set_vii:
2991 {
2992   \dim_compare:nNnT { \l__enumext_columns_sep_vii_dim } = { \c_zero_dim }
2993   {
2994     \dim_set:Nn \l__enumext_columns_sep_vii_dim
2995     {
2996       ( \l__enumext_labelwidth_vii_dim + \l__enumext_labelsep_vii_dim )
2997       / \l__enumext_columns_vii_int
2998     }
2999   }
3000   \int_set:Nn \l__enumext_tmpa_vii_int { \l__enumext_columns_vii_int - \c_one_int }
3001   \dim_set:Nn \l__enumext_item_width_vii_dim
3002   {
3003     ( \linewidth - \l__enumext_columns_sep_vii_dim * \l__enumext_tmpa_vii_int )
3004     / \l__enumext_columns_vii_int - \l__enumext_labelwidth_vii_dim
3005     - \l__enumext_labelsep_vii_dim
3006   }
3007   \dim_zero_new:N \itemwidth
3008 }

```

(End of definition for `__enumext_starred_columns_set_vii:`.)

`__enumext_starred_joined_item_vii:n`

The function `__enumext_starred_joined_item_vii:n` will set the *width* of the box in which the content passed to `\item(<number>)` will be stored together with the value of `\itemwidth`.

```

3009 \cs_new_protected:Npn \__enumext_starred_joined_item_vii:n #1
3010 {
3011   \int_set:Nn \l__enumext_joined_item_vii_int {#1}
3012   \int_compare:nNnT { \l__enumext_joined_item_vii_int } > { \l__enumext_columns_vii_int }
3013   {
3014     \msg_warning:nnee { enumext } { item-joined }
3015     { \int_use:N \l__enumext_joined_item_vii_int }
3016     { \int_use:N \l__enumext_columns_vii_int }
3017     \int_set:Nn \l__enumext_joined_item_vii_int
3018     {
3019       \l__enumext_columns_vii_int - \l__enumext_item_column_pos_vii_int + \c_one_int
3020     }
3021   }
3022   \int_compare:nNnT
3023   { \l__enumext_joined_item_vii_int }
3024   >
3025   { \l__enumext_columns_vii_int - \l__enumext_item_column_pos_vii_int + \c_one_int }
3026   {
3027     \msg_warning:nnee { enumext } { item-joined-columns }
3028     { \int_use:N \l__enumext_joined_item_vii_int }
3029     {
3030       \int_eval:n
3031       { \l__enumext_columns_vii_int - \l__enumext_item_column_pos_vii_int + \c_one_int }
3032     }
3033     \int_set:Nn \l__enumext_joined_item_vii_int
3034     {
3035       \l__enumext_columns_vii_int - \l__enumext_item_column_pos_vii_int + \c_one_int
3036     }
3037   }

```

Only need if `#1 >> 1` (default are set before).

```

3038   \int_compare:nNnTF { \l__enumext_joined_item_vii_int } > { \c_one_int }
3039   {
3040     \int_set_eq:NN \l__enumext_joined_item_aux_vii_int \l__enumext_joined_item_vii_int
3041     \int_decr:N \l__enumext_joined_item_aux_vii_int
3042     \int_add:Nn \l__enumext_item_column_pos_vii_int { \l__enumext_joined_item_aux_vii_int }
3043     \int_gadd:Nn \g__enumext_item_count_all_vii_int { \l__enumext_joined_item_aux_vii_int }
3044     \dim_set:Nn \l__enumext_joined_width_vii_dim
3045     {
3046       \l__enumext_item_width_vii_dim * \l__enumext_joined_item_vii_int
3047       + ( \l__enumext_labelwidth_vii_dim + \l__enumext_labelsep_vii_dim
3048         + \l__enumext_columns_sep_vii_dim
3049         ) * \l__enumext_joined_item_aux_vii_int

```

```

3050     }
3051     \dim_set_eq:NN \itemwidth \l__enumext_joined_width_vii_dim
3052   }
3053   {
3054     \dim_set_eq:NN \l__enumext_joined_width_vii_dim \l__enumext_item_width_vii_dim
3055     \dim_set_eq:NN \itemwidth \l__enumext_item_width_vii_dim
3056   }
3057 }

```

(End of definition for `__enumext_starred_joined_item_vii:n`.)

`__enumext_start_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`.

```

3058 \cs_new_protected:Nn \__enumext_start_mini_vii:
3059 {
3060   \dim_compare:nNnT { \l__enumext_minipage_right_vii_dim } > { \c_zero_dim }
3061   {
3062     \dim_set:Nn \l__enumext_minipage_left_vii_dim
3063     {
3064       \linewidth
3065       - \l__enumext_minipage_right_vii_dim
3066       - \l__enumext_minipage_hsep_vii_dim
3067     }
3068     \bool_set_true:N \l__enumext_minipage_active_vii_bool
3069     \dim_gset_eq:NN
3070     \g__enumext_minipage_right_vii_dim
3071     \l__enumext_minipage_right_vii_dim
3072     \__enumext_mini_addvspace_vii:
3073     \nointerlineskip\noindent
3074     \begin{__enumext_mini_env*}{ \l__enumext_minipage_left_vii_dim }
3075   }
3076 }

```

(End of definition for `__enumext_start_mini_vii:`.)

`__enumext_stop_mini_vii:` 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_star_env:nn` to execute the `__enumext_mini_env*` on the “right side”.

```

3077 \cs_new_protected:Nn \__enumext_stop_mini_vii:
3078 {
3079   \bool_if:NT \l__enumext_minipage_active_vii_bool
3080   {
3081     \end{__enumext_mini_env*}
3082     \hfill
3083     \bool_gset_true:N \g__enumext_minipage_active_vii_bool
3084   }
3085 }

```

Finally we execute code passed to the `miniright` key stored in the variable `\g__enumext_miniright_code_vii_tl` in the `__enumext_mini_env*` environment on the “right side”.

```

3086 \__enumext_after_env:nn {enumext*}
3087 {
3088   \bool_if:NT \g__enumext_minipage_active_vii_bool
3089   {
3090     \begin{__enumext_mini_env*}{ \g__enumext_minipage_right_vii_dim }
3091     \par\addvspace { \g__enumext_minipage_right_skip }
3092     \bool_if:NF \g__enumext_minipage_center_vii_bool
3093     {
3094       \centering
3095     }
3096     \tl_use:N \g__enumext_miniright_code_vii_tl % the code
3097     \end{__enumext_mini_env*}
3098     \par\addvspace{ \g__enumext_minipage_after_skip }
3099   }
3100   \bool_gset_false:N \g__enumext_minipage_active_vii_bool
3101   \bool_gset_true:N \g__enumext_minipage_center_vii_bool
3102   \tl_gclear:N \g__enumext_miniright_code_vii_tl
3103   \dim_gzero:N \g__enumext_minipage_right_vii_dim
3104 }

```

(End of definition for `__enumext_stop_mini_vii:`.)

`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.

```

3105 \NewDocumentEnvironment{enumext*}{ o }
3106 {
3107   \__enumext_safe_exec_vii:
3108   \__enumext_parse_keys_vii:n {#1}
3109   \__enumext_before_list_vii:
3110   \__enumext_start_store_level_vii:
3111   \__enumext_start_list:nn { }
3112   {
3113     \__enumext_list_arg_two_vii:
3114     \__enumext_before_keys_exec_vii:
3115   }
3116   \__enumext_starred_columns_set_vii:
3117   \item[] \scan_stop:
3118   \cs_set_eq:NN \__enumext_stop_item_tmp_vii: \noindent
3119   \cs_set_eq:NN \item \__enumext_start_item_tmp_vii:
3120 }
3121 {
3122   \__enumext_stop_item_tmp_vii:
3123   \__enumext_remove_extra_parsep_vii:
3124   \__enumext_stop_list:
3125   \__enumext_stop_store_level_vii:
3126   \__enumext_after_list_vii:
3127 }

```

(End of definition for `enumext*`. This function is documented on page 4.)

`__enumext_safe_exec_vii:` First check the maximum nesting level for the `enumext*` environment then set the vars `\l__enumext_starred_bool` and `\g__enumext_starred_bool`.

```

3128 \cs_new_protected:Nn \__enumext_safe_exec_vii:
3129 {
3130   \__enumext_current_env_set_bool:
3131   \int_incr:N \l__enumext_level_h_int
3132   \int_compare:nNnT { \l__enumext_level_h_int } > { 1 }
3133   {
3134     \msg_error:nn { enumext } { nested }
3135   }
3136   \bool_set_true:N \l__enumext_starred_bool
3137   \bool_lazy_all:nT
3138   {
3139     { \bool_if_p:N \g__enumext_starred_bool }
3140     { \int_compare_p:nNn { \l__enumext_level_h_int } = { 1 } }
3141     { \int_compare_p:nNn { \l__enumext_level_int } = { 0 } }
3142   }
3143   {
3144     \typeout{[ON-FIRST-LEVEL-ENUMEXT*-NOT-NESTED]}
3145     \bool_set_true:N \l__enumext_starred_level_one_bool
3146   }
3147 }

```

(End of definition for `__enumext_safe_exec_vii:`.)

`__enumext_parse_keys_vii:n` Parse [`<key = val>`] for `enumext*`. If the variable `\l__enumext_store_active_bool` is true it will call the function `__enumext_parse_store_keys_vii:n` and reprocess the keys to pass them to the storage sequence.

```

3148 \cs_new_protected:Npn \__enumext_parse_keys_vii:n #1
3149 {
3150   \tl_if_novalue:nF {#1}
3151   {
3152     \str_clear:N \l__enumext_series_str
3153     \keys_set:nn { enumext / enumext* } {#1}
3154     \__enumext_parse_series_name:n {#1}
3155     \bool_if:NT \l__enumext_store_active_bool
3156     {
3157       \__enumext_parse_store_keys_vii:n {#1}
3158     }
3159   }
3160 }

```


(End of definition for `__enumext_parse_keys_vii:n`.)

`__enumext_parse_store_keys_vii:n`

The function `__enumext_parse_store_keys_vii:n` searches for the values of the `columns` and `columns-sep` keys in the optional argument in `enumext*` environment as long as the starred versions of the `columns*` and `columns-sep*` keys are not active. The captured values are stored in the variable `\l__enumext_store_opt_vii_tl` which is used by the function `__enumext_store_level_open_vii:`.

```

3161 \cs_new_protected:Npn \__enumext_parse_store_keys_vii:n #1
3162 {
3163   \bool_if:NF \l__enumext_store_columns_vii_bool
3164   {
3165     \regex_match:nnT { \b columns\b } {#1}
3166     {
3167       \int_set_eq:NN
3168         \l__enumext_store_columns_vii_int
3169         \l__enumext_columns_vii_int
3170       \tl_put_right:Ne \l__enumext_store_opt_vii_tl
3171         {
3172           columns = \exp_not:V \l__enumext_store_columns_vii_int ,
3173         }
3174     }
3175   }
3176   \bool_if:NF \l__enumext_store_columns_sep_vii_bool
3177   {
3178     \regex_match:nnT { \b columns-sep\b } {#1}
3179     {
3180       \dim_set_eq:NN
3181         \l__enumext_store_columns_sep_vii_dim
3182         \l__enumext_columns_sep_vii_dim
3183       \tl_put_right:Ne \l__enumext_store_opt_vii_tl
3184         {
3185           columns-sep = \exp_not:V \l__enumext_store_columns_sep_vii_dim,
3186         }
3187     }
3188   }
3189 }

```

(End of definition for `__enumext_parse_store_keys_vii:n`.)

`__enumext_before_list_vii:`

The function `__enumext_before_list_vii:` 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_vii:` handle by `mini-env`.

```

3190 \cs_new_protected:Nn \__enumext_before_list_vii:
3191 {
3192   \__enumext_vspace_above_vii:
3193   \__enumext_check_ans_exec: % need by chek-ans
3194   \__enumext_before_args_exec_vii:
3195   \__enumext_start_mini_vii:
3196 }

```

(End of definition for `__enumext_before_list_vii:`.)

`__enumext_after_list_vii:`

The function `__enumext_after_list:` first call the function `__enumext_stop_mini_vii:`, then apply the `{\code}` handled by the `after` key together with the *vertical space* handled by the `below` key if they are present. Finally set false the vars `\g__enumext_starred_bool` and `\l__enumext_starred_bool`, save the *current value* of the counter in `\g__enumext_resume_vii_int` for the `resume` key. If the `save-ans` key is active, it will create the integer variable for the `resume` key, we only have to assign it the value of the current counter.

```

3197 \cs_new_protected:Nn \__enumext_after_list_vii:
3198 {
3199   \__enumext_stop_mini_vii:
3200   \__enumext_after_stop_list_vii:
3201   \__enumext_vspace_below_vii:
3202   \int_gset_eq:NN \g__enumext_resume_vii_int \value{enumXvii}
3203   \int_if_exist:cT { g__enumext_resume_ \l__enumext_store_name_tl _int }
3204   {
3205     \int_gset_eq:cN
3206       { g__enumext_resume_ \l__enumext_store_name_tl _int }
3207       { \value{enumXvii} }
3208   }

```

```

3209 \bool_lazy_and:nnT
3210 { \bool_if_p:N \g__enumext_starred_bool }
3211 { \bool_if_p:N \l__enumext_check_ans_bool }
3212 {
3213     \bool_gset_true:N \g__enumext_check_ans_show_h_bool
3214     \tl_gset:NV \g__enumext_store_name_tl \l__enumext_store_name_tl
3215 }
3216 %\bool_gset_false:N \g__enumext_starred_bool
3217 \bool_set_false:N \l__enumext_starred_bool
3218 }

```

(End of definition for `__enumext_after_list_vii:`)

`__enumext_start_store_level_vii:`
`__enumext_stop_store_level_vii:`

The `__enumext_start_store_level_vii:` and `__enumext_stop_store_level_vii:` functions activate the level saving mechanism for storage in *(sequence)* of the `\anskey` command if `enumext*` are nested in `enumext`.

```

3219 \cs_new_protected:Nn \__enumext_start_store_level_vii:
3220 {
3221     \bool_if:NT \l__enumext_store_active_bool
3222     {
3223         \int_compare:nNnT { \l__enumext_level_int } > { \c_zero_int }
3224         {
3225             \__enumext_store_level_open_vii:
3226         }
3227     }
3228 }
3229 \cs_new_protected:Nn \__enumext_stop_store_level_vii:
3230 {
3231     \bool_if:NT \l__enumext_store_active_bool
3232     {
3233         \int_compare:nNnT { \l__enumext_level_int } > { \c_zero_int }
3234         {
3235             \__enumext_store_level_close_vii:
3236         }
3237     }
3238 }

```

(End of definition for `__enumext_start_store_level_vii:` and `__enumext_stop_store_level_vii:`)

10.35.2 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`.

```

3239 \cs_new_protected_nopar:Nn \__enumext_start_item_tmp_vii:
3240 {
3241     \__enumext_stop_item_tmp_vii:
3242     \int_incr:N \l__enumext_item_column_pos_vii_int
3243     \int_gincr:N \g__enumext_item_count_all_vii_int
3244     \__enumext_item_peek_args_vii:
3245 }

```

(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).

```

3246 \cs_new_protected:Nn \__enumext_item_peek_args_vii:
3247 {
3248     \peek_meaning:NTF (
3249         { \__enumext_joined_item_vii:w }
3250         { \__enumext_joined_item_vii:w (1) }
3251     }

```

(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_standard_item_vii:w`.

```

3252 \cs_new_protected:Npn \__enumext_joined_item_vii:w (#1)
3253 {
3254   \__enumext_starred_joined_item_vii:n {#1}
3255   \peek_meaning_remove:NTF *
3256   { \__enumext_starred_item_vii:w }
3257   { \__enumext_standard_item_vii:w }
3258 }

```

(End of definition for `__enumext_joined_item_vii:w`.)

`__enumext_standard_item_vii:w` The function `__enumext_standard_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]`.

```

3259 \cs_new_protected:Npn \__enumext_standard_item_vii:w
3260 {
3261   \bool_set_false:N \l__enumext_item_starred_vii_bool
3262   \peek_meaning:NTF [
3263   {
3264     \bool_set_eq:NN
3265     \l__enumext_wrap_label_vii_bool
3266     \l__enumext_wrap_label_opt_vii_bool
3267     \__enumext_start_item_vii:w
3268   }
3269   {
3270     \bool_set_true:N \l__enumext_wrap_label_vii_bool
3271     \legacy_if_set_true:n { @noitemarg }
3272     \__enumext_start_item_vii:w [ \l__enumext_label_vii_tl ]
3273   }
3274 }

```

(End of definition for `__enumext_standard_item_vii:w`.)

`__enumext_starred_item_vii: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⟩]`.

```

3275 \cs_new_protected:Npn \__enumext_starred_item_vii:w
3276 {
3277   \bool_set_true:N \l__enumext_item_starred_vii_bool
3278   \bool_set_true:N \l__enumext_wrap_label_vii_bool
3279   \peek_meaning:NTF [
3280   { \__enumext_starred_item_vii_aux_i:w }
3281   { \__enumext_starred_item_vii_aux_ii:w }
3282 }
3283 \cs_new_protected:Npn \__enumext_starred_item_vii_aux_i:w [#1]
3284 {
3285   \tl_gset:Nn \g__enumext_item_symbol_aux_vii_tl {#1}
3286   \__enumext_starred_item_vii_aux_ii:w
3287 }
3288 \cs_new_protected:Npn \__enumext_starred_item_vii_aux_ii:w
3289 {
3290   \peek_meaning:NTF [
3291   { \__enumext_starred_item_vii_aux_iii:w }
3292   {
3293     \dim_set_eq:NN
3294     \l__enumext_item_symbol_sep_vii_dim
3295     \l__enumext_labelsep_vii_dim
3296     \legacy_if_set_true:n { @noitemarg }
3297     \__enumext_start_item_vii:w [ \l__enumext_label_vii_tl ]
3298   }
3299 }
3300 \cs_new_protected:Npn \__enumext_starred_item_vii_aux_iii:w [#1]
3301 {

```

```

3302 \dim_set:Nn \l__enumext_item_symbol_sep_vii_dim {#1}
3303 \legacy_if_set_true:n { @noitemarg }
3304 \__enumext_start_item_vii:w [ \l__enumext_label_vii_tl ]
3305 }

```

(End of definition for `__enumext_starred_item_vii:w` and others.)

10.35.3 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 the value of `__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.

```

3306 \cs_new_protected_nopar:Npn \__enumext_start_item_vii:w [#1]
3307 {
3308   \cs_set_eq:NN \__enumext_stop_item_tmp_vii: \__enumext_stop_item_vii:
3309   \legacy_if:nT { @noitemarg }
3310   {
3311     \legacy_if_set_false:n { @noitemarg }
3312     \legacy_if:nT { @nmbrrlist }
3313     {
3314       \bool_if:NT \l__enumext_hyperref_bool
3315       {
3316         \legacy_if_set_true:n { @hyper@item }
3317       }
3318       \refstepcounter{enumXvii}
3319       \bool_if:NT \l__enumext_check_ans_bool
3320       {
3321         \int_gincr:N \g__enumext_count_item_number_int
3322       }
3323     }
3324   }

```

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.

```

3325 \group_begin:
3326 \lrbox{ \l__enumext_item_text_vii_box }
3327 \bool_if:NF \l__enumext_footnotes_key_bool
3328 {
3329   \__enumext_renew_footnote:
3330 }
3331 \bool_if:NT \l__enumext_item_starred_vii_bool
3332 {
3333   \tl_if_blank:VT \g__enumext_item_symbol_aux_vii_tl
3334   {
3335     \tl_gset_eq:NN
3336     \g__enumext_item_symbol_aux_vii_tl \l__enumext_item_symbol_vii_tl
3337   }
3338   \mode_leave_vertical:
3339   \skip_horizontal:n { -\l__enumext_item_symbol_sep_vii_dim }
3340   \makebox[ 0pt ][ r ]{ \g__enumext_item_symbol_aux_vii_tl }
3341   \skip_horizontal:N \l__enumext_item_symbol_sep_vii_dim
3342   \tl_gclear:N \g__enumext_item_symbol_aux_vii_tl
3343 }
3344 \group_begin:
3345 \tl_use:N \l__enumext_label_font_style_vii_tl
3346 \bool_if:NTF \l__enumext_wrap_label_vii_bool
3347 {
3348   \makebox[ \l__enumext_labelwidth_vii_dim ][ \l__enumext_align_label_vii_str ]
3349   { \__enumext_wrapper_label_vii:n {#1} }
3350 }
3351 {
3352   \makebox[ \l__enumext_labelwidth_vii_dim ][ \l__enumext_align_label_vii_str ]{ #1 }

```

```

3353     }
3354     \group_end:
3355     \skip_horizontal:N \l__enumext_labelsep_vii_dim
3356     \tl_use:N \l__enumext_after_list_args_vii_tl
3357     \__enumext_minipage:w [ t ]{ \l__enumext_joined_width_vii_dim }
3358     \skip_set_eq:NN \parindent \l__enumext_listparindent_vii_dim
3359     \skip_set_eq:NN \parskip \l__enumext_parsep_vii_skip
3360     \tl_use:N \l__enumext_fake_item_indent_vii_tl
3361 }

```

(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.

```

3362 \cs_new_protected_nopar:Nn \__enumext_stop_item_vii:
3363 {
3364     \__enumext_endminipage:
3365     \endlrbox
3366     \group_end:
3367     \box_set_wd:Nn \l__enumext_item_text_vii_box
3368     {
3369         \l__enumext_joined_width_vii_dim
3370         + \l__enumext_labelwidth_vii_dim
3371         + \l__enumext_labelsep_vii_dim
3372     }
3373     \int_set:Nn \hbadness { 10000 }
3374     \box_use:N \l__enumext_item_text_vii_box
3375     \bool_if:NF \l__enumext_footnotes_key_bool
3376     {
3377         \__enumext_print_footnote:
3378     }
3379     \int_compare:nNnTF { \l__enumext_item_column_pos_vii_int } = { \l__enumext_columns_vii_int }
3380     {
3381         \par\noindent
3382         \int_zero:N \l__enumext_item_column_pos_vii_int
3383     }
3384     { \hspace{ \l__enumext_columns_sep_vii_dim } }
3385 }

```

(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.

```

3386 \cs_new_protected:Nn \__enumext_remove_extra_parsep_vii:
3387 {
3388     \int_compare:nNnT
3389     {
3390         \int_mod:nn { \g__enumext_item_count_all_vii_int } { \l__enumext_columns_vii_int }
3391     }
3392     =
3393     { \c_zero_int }
3394     {
3395         \par
3396         \vspace{ -\l__enumext_itemsep_vii_skip }
3397         \int_gzero:N \g__enumext_item_count_all_vii_int
3398     }
3399 }

```

(End of definition for `__enumext_remove_extra_parsep_vii:.`)

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`.

```

3400 \__enumext_after_env:nn {enumext*}
3401 {
3402     \int_compare:nNnT { \l__enumext_level_int } = { 0 }
3403     {
3404         \bool_if:NT \g__enumext_check_ans_show_h_bool
3405         {
3406             \__enumext_check_ans_show:
3407         }
3408     }
3409 }

```

```

3408         \bool_gset_false:N \g__enumext_starred_bool
3409         \bool_gset_false:N \g__enumext_check_ans_show_h_bool
3410         \tl_gclear:N \g__enumext_store_name_tl
3411     }
3412 }

```

10.36 The keyans* environment

10.36.1 Functions for item box width

__enumext_starred_columns_set_viii:

We set the default value for the width of the box containing the content of the items and create `\itemwidth` in a public form.

```

3413 \cs_new_protected:Nn \__enumext_starred_columns_set_viii:
3414 {
3415     \dim_compare:nNnT { \l__enumext_columns_sep_viii_dim } = { \c_zero_dim }
3416     {
3417         \dim_set:Nn \l__enumext_columns_sep_viii_dim
3418         {
3419             ( \l__enumext_labelwidth_viii_dim + \l__enumext_labelsep_viii_dim )
3420             / \l__enumext_columns_viii_int
3421         }
3422     }
3423     \int_set:Nn \l__enumext_tmpa_viii_int { \l__enumext_columns_viii_int - \c_one_int }
3424     \dim_set:Nn \l__enumext_item_width_viii_dim
3425     {
3426         ( \linewidth - \l__enumext_columns_sep_viii_dim * \l__enumext_tmpa_viii_int )
3427         / \l__enumext_columns_viii_int - \l__enumext_labelwidth_viii_dim
3428         - \l__enumext_labelsep_viii_dim
3429     }
3430     \dim_zero_new:N \itemwidth
3431 }

```

(End of definition for __enumext_starred_columns_set_viii:.)

__enumext_starred_joined_item_viii:n

The function `__enumext_starred_joined_item_viii:n` will set the *width* of the box in which the content passed to `\item⟨⟨number⟩⟩` will be stored together with the value of `\itemwidth`.

```

3432 \cs_new_protected:Npn \__enumext_starred_joined_item_viii:n #1
3433 {
3434     \int_set:Nn \l__enumext_joined_item_viii_int {#1}
3435     \int_compare:nNnT { \l__enumext_joined_item_viii_int } > { \l__enumext_columns_viii_int }
3436     {
3437         \msg_warning:nnee { enumext } { item-joined }
3438         { \int_use:N \l__enumext_joined_item_viii_int }
3439         { \int_use:N \l__enumext_columns_viii_int }
3440         \int_set:Nn \l__enumext_joined_item_viii_int
3441         {
3442             \l__enumext_columns_viii_int - \l__enumext_item_column_pos_viii_int + \c_one_int
3443         }
3444     }
3445     \int_compare:nNnT
3446     { \l__enumext_joined_item_viii_int }
3447     >
3448     { \l__enumext_columns_viii_int - \l__enumext_item_column_pos_viii_int + \c_one_int }
3449     {
3450         \msg_warning:nnee { enumext } { item-joined-columns }
3451         { \int_use:N \l__enumext_joined_item_viii_int }
3452         {
3453             \int_eval:n
3454             { \l__enumext_columns_viii_int - \l__enumext_item_column_pos_viii_int + \c_one_int }
3455         }
3456         \int_set:Nn \l__enumext_joined_item_viii_int
3457         {
3458             \l__enumext_columns_viii_int - \l__enumext_item_column_pos_viii_int + \c_one_int
3459         }
3460     }
3461     \int_compare:nNnTF { \l__enumext_joined_item_viii_int } > { \c_one_int }
3462     {
3463         \int_set_eq:NN \l__enumext_joined_item_aux_viii_int \l__enumext_joined_item_viii_int
3464         \int_decr:N \l__enumext_joined_item_aux_viii_int
3465         \int_add:Nn \l__enumext_item_column_pos_viii_int { \l__enumext_joined_item_aux_viii_int }
3466         \int_gadd:Nn \g__enumext_item_count_all_viii_int { \l__enumext_joined_item_aux_viii_int }
3467         \dim_set:Nn \l__enumext_joined_width_viii_dim

```

```

3468     {
3469         \l__enumext_item_width_viii_dim * \l__enumext_joined_item_viii_int
3470         + ( \l__enumext_labelwidth_viii_dim + \l__enumext_labelsep_viii_dim
3471           + \l__enumext_columns_sep_viii_dim
3472           )*\l__enumext_joined_item_aux_viii_int
3473     }
3474     \dim_set_eq:NN \itemwidth \l__enumext_joined_width_viii_dim
3475   }
3476   {
3477     \dim_set_eq:NN \l__enumext_joined_width_viii_dim \l__enumext_item_width_viii_dim
3478     \dim_set_eq:NN \itemwidth \l__enumext_item_width_viii_dim
3479   }
3480 }

```

(End of definition for \l__enumext_starred_joined_item_viii:n.)

__enumext_start_mini_viii:
 __enumext_stop_mini_viii:

The implementation of the mini-env key is identical to the one used in the `enumext*` environment.

```

3481 \cs_new_protected:Nn \__enumext_start_mini_viii:
3482 {
3483   \dim_compare:nNtT { \l__enumext_minipage_right_viii_dim } > { \c_zero_dim }
3484   {
3485     \dim_set:Nn \l__enumext_minipage_left_viii_dim
3486     {
3487       \linewidth
3488       - \l__enumext_minipage_right_viii_dim
3489       - \l__enumext_minipage_hsep_viii_dim
3490     }
3491     \bool_set_true:N \l__enumext_minipage_active_viii_bool
3492     \dim_gset_eq:NN
3493       \g__enumext_minipage_right_viii_dim
3494       \l__enumext_minipage_right_viii_dim
3495     \__enumext_mini_addvspace_viii:
3496     \nointerlineskip\noindent
3497     \begin{__enumext_mini_env*}{ \l__enumext_minipage_left_viii_dim }
3498   }
3499 }
3500 \cs_new_protected:Nn \__enumext_stop_mini_viii:
3501 {
3502   \bool_if:NT \l__enumext_minipage_active_viii_bool
3503   {
3504     \end{__enumext_mini_env*}
3505     \hfill
3506     \bool_gset_true:N \g__enumext_minipage_active_viii_bool
3507   }
3508 }
3509 \__enumext_after_env:nn {keyans*}
3510 {
3511   \bool_if:NT \g__enumext_minipage_active_viii_bool
3512   {
3513     \begin{__enumext_mini_env*}{ \g__enumext_minipage_right_viii_dim }
3514     \par\addvspace { \g__enumext_minipage_right_skip }
3515     \bool_if:NF \g__enumext_minipage_center_viii_bool
3516     {
3517       \centering
3518     }
3519     \tl_use:N \g__enumext_miniright_code_viii_tl % the code
3520     \end{__enumext_mini_env*}
3521     \par\addvspace{ \g__enumext_minipage_after_skip }
3522   }
3523   \bool_gset_false:N \g__enumext_minipage_active_viii_bool
3524   \bool_gset_true:N \g__enumext_minipage_center_viii_bool
3525   \tl_gclear:N \g__enumext_miniright_code_viii_tl
3526   \dim_gzero:N \g__enumext_minipage_right_viii_dim
3527 }

```

(End of definition for __enumext_start_mini_viii: and __enumext_stop_mini_viii:.)

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.

```

3528 \NewDocumentEnvironment{keyans*}{ o }
3529 {
3530   \__enumext_safe_exec_viii:
3531   \__enumext_parse_keys_viii:n {#1}
3532   \__enumext_before_list_viii:
3533   \__enumext_start_list:nn { }
3534   {
3535     \__enumext_list_arg_two_viii:
3536     \__enumext_before_keys_exec_viii:
3537   }
3538   \__enumext_starred_columns_set_viii:
3539   \item[] \scan_stop:
3540   \cs_set_eq:NN \__enumext_stop_item_tmp_viii: \noindent
3541   \cs_set_eq:NN \item \__enumext_start_item_tmp_viii:
3542 }
3543 {
3544   \__enumext_stop_item_tmp_viii:
3545   \__enumext_remove_extra_parsep_viii:
3546   \__enumext_keyans_check_ans:nn { item }{ keyans* }
3547   \__enumext_stop_list:
3548   \__enumext_after_list_viii:
3549 }

```

(End of definition for `keyans*`. This function is documented on page 10.)

`__enumext_safe_exec_viii:` First check the maximum nesting level for the `keyans*` environment.

```

3550 \cs_new_protected:Nn \__enumext_safe_exec_viii:
3551 {
3552   \int_incr:N \__enumext_keyans_level_h_int
3553   \int_compare:nNnT { \__enumext_keyans_level_h_int } > { 1 }
3554   {
3555     \msg_error:nn { enumext } { nested }
3556   }
3557   % Set false for interfering with enumext nested in keyans* (yes, its possible and crayze)
3558   \bool_set_false:N \__enumext_store_active_bool
3559   \int_compare:nNnT { \__enumext_level_int } > { 1 }
3560   {
3561     \msg_error:nn { enumext } { keyans-wrong-level }
3562   }
3563 }

```

(End of definition for `__enumext_safe_exec_viii:`.)

`__enumext_parse_keys_viii:n` Parse [`<key = val>`] for `keyans*`.

```

3564 \cs_new_protected:Npn \__enumext_parse_keys_viii:n #1
3565 {
3566   \tl_if_novalue:nF {#1}
3567   {
3568     \keys_set:nn { enumext / keyans* } {#1}
3569   }
3570 }

```

(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`.

```

3571 \cs_new_protected:Nn \__enumext_before_list_viii:
3572 {
3573   \__enumext_vspace_above_viii:
3574   \__enumext_before_args_exec_viii:
3575   \__enumext_start_mini_viii:
3576 }

```

(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.

```

3577 \cs_new_protected:Nn \__enumext_after_list_viii:
3578 {

```



```

3579     \__enumext_stop_mini_viii:
3580     \__enumext_after_stop_list_viii:
3581     \__enumext_vspace_below_viii:
3582 }

```

(End of definition for __enumext_after_list_viii:.)

10.36.2 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 (`\langle number \rangle`) which works in the same way as in the `enumext*` environment. In simple terms we want to store the `\langle label \rangle` next to the `[\langle content \rangle]` if it is present in the `\langle sequence \rangle` and `\langle prop list \rangle` defined by `save-ans` key for `\item*`, `\item* [\langle content \rangle]`, `\item (\langle number \rangle) *` and `\item (\langle number \rangle) * [\langle content \rangle]` 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`.

```

3583 \cs_new_protected_nopar:Nn \__enumext_start_item_tmp_viii:
3584 {
3585     \__enumext_stop_item_tmp_viii:
3586     \int_incr:N \l__enumext_item_column_pos_viii_int
3587     \int_gincr:N \g__enumext_item_count_all_viii_int
3588     \__enumext_item_peek_args_viii:
3589 }

```

(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 (\langle number \rangle)`. Look for the argument “`(`”, if it is present we will call the function `__enumext_joined_item_viii:w (\langle number \rangle)`, 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)`.

```

3590 \cs_new_protected:Nn \__enumext_item_peek_args_viii:
3591 {
3592     \peek_meaning:NTF (
3593     { \__enumext_joined_item_viii:w }
3594     { \__enumext_joined_item_viii:w (1) }
3595 }

```

(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_standard_item_viii:w`.

```

3596 \cs_new_protected:Npn \__enumext_joined_item_viii:w (#1)
3597 {
3598     \__enumext_starred_joined_item_viii:n {#1}
3599     \peek_meaning_remove:NTF *
3600     { \__enumext_starred_item_viii:w }
3601     { \__enumext_standard_item_viii:w }
3602 }

```

(End of definition for __enumext_joined_item_viii:w.)

`__enumext_standard_item_viii:w` The function `__enumext_standard_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 [\langle custom \rangle]` 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]`.

```

3603 \cs_new_protected:Npn \__enumext_standard_item_viii:w
3604 {
3605     \bool_set_false:N \l__enumext_item_starred_viii_bool
3606     \peek_meaning:NTF [
3607     {

```

```

3608         \bool_set_eq:NN
3609         \l__enumext_wrap_label_viii_bool
3610         \l__enumext_wrap_label_opt_viii_bool
3611         \__enumext_start_item_viii:w
3612     }
3613     {
3614         \bool_set_true:N \l__enumext_wrap_label_viii_bool
3615         \legacy_if_set_true:n { @noitemarg }
3616         \__enumext_start_item_viii:w [ \l__enumext_label_viii_tl ]
3617     }
3618 }

```

(End of definition for `__enumext_standard_item_viii:w`.)

```

\__enumext_starred_item_viii:w
\__enumext_starred_item_viii_aux_i:w
\__enumext_starred_item_viii_aux_ii:w

```

The function `__enumext_starred_item_viii:w` together with the specified auxiliary functions `aux_i:w` and `aux_ii:w` execute `\item*` and `\item*[\langle content \rangle]`.

```

3619 \cs_new_protected:Npn \__enumext_starred_item_viii:w
3620 {
3621     \bool_set_true:N \l__enumext_item_starred_viii_bool
3622     \bool_set_true:N \l__enumext_wrap_label_viii_bool
3623     \peek_meaning:NTF [
3624         { \__enumext_starred_item_viii_aux_i:w }
3625         { \__enumext_starred_item_viii_aux_ii:w }
3626     }

```

The optional argument will be captured in the variables `\l__enumext_keyans_tmpa_tl` and `\l__enumext_keyans_tmpb_tl` which we will use later for the implementation of the `show-ans` and `show-pos` keys together with the stored in `\sequence` and `\prop list`.

```

3627 \cs_new_protected:Npn \__enumext_starred_item_viii_aux_i:w [#1]
3628 {
3629     \tl_clear:N \l__enumext_store_keyans_label_tl
3630     \tl_if_no_value:nF { #1 }
3631     {
3632         \tl_if_empty:NF \l__enumext_store_keyans_item_opt_sep_tl
3633         {
3634             \tl_put_right:Ne \l__enumext_store_keyans_label_tl { \l__enumext_store_keyans_item_opt_sep_tl }
3635             \tl_put_right:Ne \l__enumext_store_keyans_label_tl { #1 }
3636         }
3637         \tl_set:Ne \l__enumext_keyans_item_opt_tl { #1 }
3638     }
3639     \__enumext_starred_item_viii_aux_ii:w
3640 }
3641 \cs_new_protected:Npn \__enumext_starred_item_viii_aux_ii:w
3642 {
3643     \legacy_if_set_true:n { @noitemarg }
3644     \__enumext_start_item_viii:w [ \l__enumext_label_viii_tl ]
3645 }

```

(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 `[\langle content \rangle]` for `\item*[\langle content \rangle]` 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.

```

3646 \cs_new_protected:Nn \__enumext_starred_item_exec:
3647 {
3648     \tl_put_left:Ne \l__enumext_store_keyans_label_tl { \l__enumext_label_viii_tl }
3649     \__enumext_store_addto_prop:V \l__enumext_store_keyans_label_tl
3650     \__enumext_keyans_store_ref:
3651     \tl_put_left:Ne \l__enumext_store_keyans_label_tl { \item }
3652     \__enumext_keyans_addto_seq_link:
3653     \bool_if:NT \l__enumext_show_answer_bool
3654     {
3655         \__enumext_print_keyans_box:NN \l__enumext_labelwidth_i_dim \l__enumext_labelsep_i_dim
3656     }
3657     \bool_if:NT \l__enumext_show_position_bool
3658     {
3659         \tl_set:Ne \l__enumext_mark_answer_sym_tl
3660         {
3661             \group_begin:

```

```

3662         \exp_not:N \normalfont
3663         \exp_not:N \footnotesize [ \int_eval:n
3664         {
3665             \prop_count:c { g__enumext_ \l__enumext_store_name_tl _prop }
3666         }
3667     ]
3668     \group_end:
3669 }
3670 \__enumext_print_keyans_box:NN \l__enumext_labelwidth_i_dim \l__enumext_labelsep_i_dim
3671 }
3672 }

```

(End of definition for `__enumext_starred_item_exec:`.)

Real definition of `\item` in `keyans*`

The implementation at this point is very similar to that of the `enumext*` environment.

```

3673 \cs_new_protected_nopar:Npn \__enumext_start_item_viii:w [#1]
3674 {
3675     \cs_set_eq:NN \__enumext_stop_item_tmp_viii: \__enumext_stop_item_viii:
3676     \legacy_if:nT { @noitemarg }
3677     {
3678         \legacy_if_set_false:n { @noitemarg }
3679         \legacy_if:nT { @nmbrrlist }
3680         {
3681             \bool_if:NT \l__enumext_hyperref_bool
3682             {
3683                 \legacy_if_set_true:n { @hyper@item }
3684             }
3685             \refstepcounter{enumXviii}
3686         }
3687     }

```

Here we start capturing `\item` and its contents into a group using the plain form of the `lrbox` environment.

```

3688     \group_begin:
3689     \lrbox{ \l__enumext_item_text_viii_box }
3690     \bool_if:NF \l__enumext_footnotes_key_bool
3691     {
3692         \__enumext_renew_footnote:
3693     }
3694     \bool_if:NT \l__enumext_item_starred_viii_bool
3695     {
3696         \__enumext_starred_item_exec:
3697     }
3698     \group_begin:
3699     \tl_use:N \l__enumext_label_font_style_viii_tl
3700     \bool_if:NTF \l__enumext_wrap_label_viii_bool
3701     {
3702         \makebox[ \l__enumext_labelwidth_viii_dim ][ \l__enumext_align_label_viii_str ]
3703         { \__enumext_wrapper_label_viii:n {#1} }
3704     }
3705     {
3706         \makebox[ \l__enumext_labelwidth_viii_dim ][ \l__enumext_align_label_viii_str ]{ #1
3707     }
3708     \group_end:
3709     \skip_horizontal:N \l__enumext_labelsep_viii_dim
3710     \tl_use:N \l__enumext_after_list_args_viii_tl
3711     \__enumext_minipage:w [ t ]{ \l__enumext_joined_width_viii_dim }
3712     \skip_set_eq:NN \parindent \l__enumext_listparindent_viii_dim
3713     \skip_set_eq:NN \parskip \l__enumext_parsep_viii_skip
3714     \bool_if:NT \l__enumext_item_starred_viii_bool
3715     {
3716         \tl_use:N \l__enumext_fake_item_indent_viii_tl
3717         \__enumext_keyans_show_item_opt: \skip_horizontal:n { -\l__enumext_fake_item_indent.
3718     }
3719     {
3720         \tl_use:N \l__enumext_fake_item_indent_viii_tl
3721     }
3722 }

```

(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.

```

3723 \cs_new_protected_nopar:Nn \__enumext_stop_item_viii:
3724 {
3725     \__enumext_endminipage:
3726     \endlrbox
3727     \group_end:
3728     \box_set_wd:Nn \l__enumext_item_text_viii_box
3729     {
3730         \l__enumext_joined_width_viii_dim
3731         + \l__enumext_labelwidth_viii_dim
3732         + \l__enumext_labelsep_viii_dim
3733     }
3734     \int_set:Nn \hbadness { 10000 }
3735     \box_use:N \l__enumext_item_text_viii_box
3736     \bool_if:NF \l__enumext_footnotes_key_bool
3737     {
3738         \__enumext_print_footnote:
3739     }
3740     \int_compare:nNnTF { \l__enumext_item_column_pos_viii_int } = { \l__enumext_columns_viii_int }
3741     {
3742         \par\noindent
3743         \int_zero:N \l__enumext_item_column_pos_viii_int
3744     }
3745     { \hspace{ \l__enumext_columns_sep_viii_dim } }
3746 }

```

(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.

```

3747 \cs_new_protected:Nn \__enumext_remove_extra_parsep_viii:
3748 {
3749     \int_compare:nNnT
3750     {
3751         \int_mod:nn { \g__enumext_item_count_all_viii_int } { \l__enumext_columns_viii_int }
3752     }
3753     =
3754     { \c_zero_int }
3755     {
3756         \par
3757         \vspace{ -\l__enumext_itemsep_viii_skip }
3758         \int_gzero:N \g__enumext_item_count_all_viii_int
3759     }
3760 }

```

(End of definition for `__enumext_remove_extra_parsep_viii:`)

10.37 The command `\getkeyans`

`\getkeyans` The `\getkeyans` command takes a mandatory argument of the form $\langle \textit{store name} : \textit{position} \rangle$. Retrieve a “single” content stored by `\anskey`, `\anspic*` and `\item*` from *prop list* defined by `save-ans` key.

```

3761 \NewDocumentCommand \getkeyans { m }
3762 {
3763     \exp_args:Ne \__enumext_getkeyans_aux:n
3764     { \tl_to_str:e { \text_expand:n {#1} } }
3765 }

```

(End of definition for `\getkeyans`. This function is documented on page 12.)

`__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.

```

3766 \cs_new_protected:Npn \__enumext_getkeyans_aux:n #1
3767 {
3768     \str_if_in:nnTF {#1} { : }
3769     {
3770         \use:e
3771         {
3772             \cs_set:Npn \exp_not:N \__enumext_tmp:w ##1 \c_colon_str ##2 \scan_stop:
3773             { {##1} {##2} }

```

```

3774     }
3775     \exp_after:wN \__enumext_getkeyans:nn \__enumext_tmp:w #1 \scan_stop:
3776   }
3777   { \msg_error:nnn { enumext } { missing-colon } {#1} }
3778 }

```

(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⟩*.

```

3779 \cs_new_protected:Npn \__enumext_getkeyans:nn #1 #2
3780 {
3781   \prop_if_exist:cF { g__enumext_#1_prop }
3782   { \msg_error:nnn { enumext } { undefined-storage-anskey } {#1} }
3783   \group_begin:
3784     \prop_item:cn { g__enumext_#1_prop }{#2}
3785   \group_end:
3786 }

```

(End of definition for __enumext_getkeyans:nn.)

10.38 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 to define a set of *⟨keys⟩* with which we will control the options of the different nesting levels for the enumext and enumext* environment by storing the values of these in the token list variables \l__enumext_print_keyans_X_tl.

```

3787 \keys_define:nn { keyanskey / print }
3788 {
3789   level-1 .code:n = \tl_put_right:Nn \l__enumext_print_keyans_i_tl
3790                   {
3791                     \setenumext[level,1] {#1} \setenumext[print,1] {#1}
3792                   },
3793   level-1 .initial:n = { label=\arabic*., nosep, columns=2, first=\small, font=\small },
3794   level-2 .code:n = \tl_put_right:Nn \l__enumext_print_keyans_ii_tl
3795                   {
3796                     \setenumext[level,2] {#1} \setenumext[print,2] {#1}
3797                   },
3798   level-2 .initial:n = { nosep, label=(\alph*), first=\small, font=\small },
3799   level-3 .code:n = \tl_put_right:Nn \l__enumext_print_keyans_iii_tl
3800                   {
3801                     \setenumext[level,3] {#1} \setenumext[print,3] {#1}
3802                   },
3803   level-3 .initial:n = { nosep, label=\roman*., first=\small, font=\small },
3804   level-4 .code:n = \tl_put_right:Nn \l__enumext_print_keyans_iv_tl
3805                   {
3806                     \setenumext[level,4] {#1} \setenumext[print,4] {#1}
3807                   },
3808   level-4 .initial:n = { nosep, label=\Alph*., first=\small, font=\small },
3809   level-* .code:n = \tl_put_right:Nn \l__enumext_print_keyans_vii_tl % starred
3810                   {
3811                     \setenumext[enumext*] {#1} %%\setenumext[print,*] {#1}
3812                   },
3813   level-* .initial:n = { label=\arabic*., nosep, columns=2, first=\small, font=\small },
3814 }

```

\printkeyans Create a user command to print “all stored content” in *⟨sequence⟩* for \anskey, \item* and \anspic*.

```

3815 \NewDocumentCommand \printkeyans { s O{} m }
3816 {
3817   \group_begin:
3818     \tl_use:N \l__enumext_print_keyans_i_tl
3819     \tl_use:N \l__enumext_print_keyans_ii_tl
3820     \tl_use:N \l__enumext_print_keyans_iii_tl
3821     \tl_use:N \l__enumext_print_keyans_iv_tl
3822     \tl_use:N \l__enumext_print_keyans_vii_tl
3823     \__enumext_printkeyans:nnn { #1 } { #2 } { #3 }
3824   \group_end:
3825 }

```

(End of definition for \printkeyans. This function is documented on page 12.)

`__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 fetch the content specified by the first argument mapping the *(sequence)*.

#1: starred
#2: key-val
#3: seq-name

```

3826 \cs_new_protected:Npn \__enumext_printkeyans:nnn #1 #2 #3
3827 {
3828   \seq_if_exist:cTF { g__enumext_#3_seq }
3829   {
3830     \seq_if_empty:cF { g__enumext_#3_seq }
3831     {
3832       %%\seq_show:c { g__enumext_#3_seq }
3833       \bool_if:nTF {#1}
3834       {
3835         \begin{enumext*}[#2]
3836         \seq_map_inline:cn { g__enumext_#3_seq } { ##1 }
3837         \end{enumext*}
3838       }
3839       {
3840         \begin{enumext}[#2]
3841         \seq_map_inline:cn { g__enumext_#3_seq } { ##1 }
3842         \end{enumext}
3843       }
3844     }
3845   }
3846   {
3847     \msg_error:nnn { enumext } { undefined-storage-anskey } {#3}
3848   }
3849 }

```

(End of definition for `__enumext_printkeyans:nnn`.)

10.39 The command `\setenumext`

First we define a “meta families” of *(keys)* to access from `\setenumext`.

```

3850 \keys_define:nn { enumext / meta-families }
3851 {
3852   level-1 .code:n = { \keys_set:nn { enumext / level-1 } {#1} } ,
3853   level-2 .code:n = { \keys_set:nn { enumext / level-2 } {#1} } ,
3854   level-3 .code:n = { \keys_set:nn { enumext / level-3 } {#1} } ,
3855   level-4 .code:n = { \keys_set:nn { enumext / level-4 } {#1} } ,
3856   keyans .code:n = { \keys_set:nn { enumext / keyans } {#1} } ,
3857   enumext* .code:n = { \keys_set:nn { enumext / enumext* } {#1} } ,
3858   keyans* .code:n = { \keys_set:nn { enumext / keyans* } {#1} } ,
3859   print-1 .code:n = { \keys_set:nn { keyanskey / print } { level-1 = {#1} } } ,
3860   print-2 .code:n = { \keys_set:nn { keyanskey / print } { level-2 = {#1} } } ,
3861   print-3 .code:n = { \keys_set:nn { keyanskey / print } { level-3 = {#1} } } ,
3862   print-4 .code:n = { \keys_set:nn { keyanskey / print } { level-4 = {#1} } } ,
3863   print-* .code:n = { \keys_set:nn { keyanskey / print } { level-* = {#1} } } ,
3864   unknown .code:n = { \msg_error:nn { enumext } { unknown-key-family } } ,
3865 }

```

We store them in the constant sequence `\c__enumext_all_families_seq` separated by commas.

```

3866 \seq_const_from_clist:Nn \c__enumext_all_families_seq
3867 {
3868   level-1 , level-2 , level-3 , level-4 , keyans , enumext* ,
3869   keyans* , print-1 , print-2 , print-3 , print-4 , print-* ,
3870 }

```

`\setenumext`

Now we define the user command `\setenumext`.

```

3871 \NewDocumentCommand \setenumext { o +m }
3872 {
3873   \tl_if_noalue:nTF {#1}
3874   {
3875     \seq_map_inline:Nn \c__enumext_all_families_seq
3876     {
3877       \seq_clear:N \l__enumext_setkey_tmpa_seq
3878       \seq_set_from_clist:Nn \l__enumext_setkey_tmpb_seq {#1}
3879       \int_set:Nn \l__enumext_setkey_tmpa_int

```

```

3881         {
3882             \seq_count:N \l__enumext_setkey_tmpb_seq
3883         }
3884     \int_compare:nNnTF { \l__enumext_setkey_tmpa_int } > { 1 }
3885     {
3886         \seq_pop_left:NN \l__enumext_setkey_tmpb_seq \l__enumext_setkey_tmpa_tl
3887         \seq_map_function:NN \l__enumext_setkey_tmpb_seq \l__enumext_set_parse:n
3888         \seq_set_map_e:NNn \l__enumext_setkey_tmpa_seq \l__enumext_setkey_tmpa_seq
3889         {
3890             \tl_use:N \l__enumext_setkey_tmpa_tl - ##1
3891         }
3892     }
3893     {
3894         \seq_put_right:Ne \l__enumext_setkey_tmpa_seq { \tl_trim_spaces:n {#1} }
3895     }
3896     \seq_if_empty:NTF \l__enumext_setkey_tmpa_seq
3897     { \seq_map_inline:Nn \c__enumext_all_families_seq }
3898     { \seq_map_inline:Nn \l__enumext_setkey_tmpa_seq }
3899 }
3900 {
3901     \keys_set:nn { enumext / meta-families } { ##1 = {#2} }
3902 }
3903 }

```

(End of definition for `\setenumext`. This function is documented on page 5.)

`__enumext_set_parse:n`
`__enumext_set_error:nn`

Internal functions used by the `\setenumext` command.

```

3904 \cs_new_protected:Npn \__enumext_set_parse:n #1
3905 {
3906     \tl_set:Ne \l__enumext_setkey_tmpb_tl { \tl_trim_spaces:n {#1} }
3907     \int_step_inline:nnn { 0 } { 4 } % <- max level
3908     { \tl_remove_all:Nn \l__enumext_setkey_tmpb_tl {##1} }
3909     \tl_if_empty:NTF \l__enumext_setkey_tmpb_tl
3910     {
3911         \seq_put_right:Ne \l__enumext_setkey_tmpa_seq
3912         { \tl_trim_spaces:n {#1} }
3913     }
3914     { \__enumext_set_error:nn {#1} { } }
3915 }
3916 \cs_new_protected:Npn \__enumext_set_error:nn #1 #2
3917 { \msg_error:nnn { enumext } { invalid-key } {#1} {#2} }

```

(End of definition for `__enumext_set_parse:n` and `__enumext_set_error:nn`.)

10.40 Messages

Message used by package-load for `multicol` and `hyperref` packages.

```

3918 \msg_new:nnn { enumext } { package-load }
3919 {
3920     The ~ '#1' ~ package ~ is ~ already ~ loaded.
3921 }
3922 \msg_new:nnn { enumext } { package-not-load }
3923 {
3924     The ~ '#1' ~ package ~ will ~ be ~ loaded ~ as ~ a ~ dependency.
3925 }
3926 \msg_new:nnn { enumext } { package-load-foot }
3927 {
3928     The ~ '#1' ~ package ~ is ~ loaded ~ with ~ the ~ option ~ '#2'.
3929 }

```

Message used in the creation of counters by `enumext` package.

```

3930 \msg_new:nnn { enumext } { counters }
3931 {
3932     The ~ counter ~ '#1' ~ is ~ already ~ defined ~ by ~ some ~ \\
3933     package ~ or ~ macro, ~ it ~ cannot ~ be ~ continued.
3934 }

```

Message used by `[⟨key = val⟩]` system and `\setenumext` command.

```

3935 \msg_new:nnn { enumext } { invalid-key }
3936 {
3937     The ~ key ~ '#1' ~ is ~ not ~ know ~ the ~ level ~ #2.

```

```

3938 }
3939 \msg_new:nnn { enumext } { unknown-key-family }
3940 {
3941   Unknown~key~family~`\l_keys_key_str'~for~enumext.
3942 }

```

Messages used in length calculation.

```

3943 \msg_new:nnn { enumext } { width-negative }
3944 {
3945   Ignoring ~ negative ~ value ~ '#1=#2' ~ \msg_line_context:.\
3946   The ~ key ~ '#1'~ accepts ~ values ~ >= ~ opt.
3947 }
3948 \msg_new:nnn { enumext } { width-zero }
3949 {
3950   Invalid ~ '#1=#2' ~ \msg_line_context:.\
3951   The ~ key ~ '#1'~ accepts ~ values ~ > ~ opt.
3952 }

```

Messages used by `show-length` key in `enumext`.

```

3953 \msg_new:nnn { enumext } { list-lengths }
3954 {
3955   **** ~ Lengths ~ used ~ by ~ 'enumext' ~ level ~ '#2' ~ \msg_line_context:~\c_space_tl ****\
3956   \__enumext_show_length:nnn { dim } { labelsep } {#1}
3957   \__enumext_show_length:nnn { dim } { labelwidth } {#1}
3958   \__enumext_show_length:nnn { dim } { itemindent } {#1}
3959   \__enumext_show_length:nnn { dim } { leftmargin } {#1}
3960   \__enumext_show_length:nnn { dim } { rightmargin } {#1}
3961   \__enumext_show_length:nnn { dim } { listparindent } {#1}
3962   \__enumext_show_length:nnn { skip } { topsep } {#1}
3963   \__enumext_show_length:nnn { skip } { parsep } {#1}
3964   \__enumext_show_length:nnn { skip } { partopsep } {#1}
3965   \__enumext_show_length:nnn { skip } { itemsep } {#1}
3966   *****
3967 }

```

Messages used by `show-length` key in `enumext*`, `keyans*` and `keyans`.

```

3968 \msg_new:nnn { enumext } { list-lengths-not-nested }
3969 {
3970   **** ~ Lengths ~ used ~ by ~ '#2' ~ environment ~ \msg_line_context:~\c_space_tl ****\
3971   \__enumext_show_length:nnn { dim } { labelsep } {#1}
3972   \__enumext_show_length:nnn { dim } { labelwidth } {#1}
3973   \__enumext_show_length:nnn { dim } { itemindent } {#1}
3974   \__enumext_show_length:nnn { dim } { leftmargin } {#1}
3975   \__enumext_show_length:nnn { dim } { rightmargin } {#1}
3976   \__enumext_show_length:nnn { dim } { listparindent } {#1}
3977   \__enumext_show_length:nnn { skip } { topsep } {#1}
3978   \__enumext_show_length:nnn { skip } { parsep } {#1}
3979   \__enumext_show_length:nnn { skip } { partopsep } {#1}
3980   \__enumext_show_length:nnn { skip } { itemsep } {#1}
3981   *****
3982 }

```

Messages used by `save-ans` key.

```

3983 \msg_new:nnn { enumext } { save-ans-empty }
3984 {
3985   The ~ 'save-ans' ~ key ~ cannot ~ be ~ empty~ in ~ '#1'. ~ \msg_line_context:.
3986 }
3987 \msg_new:nnn { enumext } { save-ans-nested }
3988 {
3989   The ~ 'save-ans' ~ key ~ cannot ~ be ~ used ~ in ~ nested ~ '#1'. ~ \msg_line_context:.
3990 }

```

Messages used by the internal system to check answer used by `check-ans` key.

```

3991 \msg_new:nnn { enumext } { items-same-answer }
3992 {
3993   *****~Checking~answers~on~'#1'~OK~*****\
3994   **~ All ~ items ~ stored ~ in ~ sequence ~ '#1' ~ have ~ an ~ answer. \
3995   *****
3996   \prg_replicate:nn { 7 + \str_count:n {#1} } { * }
3997 }
3998 \msg_new:nnn { enumext } { item-different-answer }
3999 {
4000   Number ~ of ~ items ~ different ~ of ~ number ~ of ~

```



```

4001     answer ~ in ~ sequence ~ '#1' ~ closed ~ \msg_line_context:.
4002 }

```

Messages used by the internal system to check for “starred” \item* commands.

```

4003 \msg_new:nnn { enumext } { missing-starred }
4004 {
4005     Missing ~ '\c_backslash_str #1*' ~ in ~ '#2' ~ \msg_line_context:.
4006 }

```

Message for the nesting depth of the environment `enumext`.

```

4007 \msg_new:nnn { enumext } { list-too-deep }
4008 {
4009     Too ~ deep ~ nesting ~ for ~ 'enumext' ~ \msg_line_context:.. \\
4010     The ~ maximum ~ level ~ of ~ nesting ~ is ~ 4.
4011 }

```

Messages used by \anskey and \anspic commands.

```

4012 \msg_new:nnn { enumext } { anskey-wrong-place }
4013 {
4014     Wrong ~ place ~ for ~ command ~ '\c_backslash_str #1' ~ \msg_line_context:.. \\
4015     '\c_backslash_str #1' ~ works ~ in ~ the ~ environment ~ '#2'.
4016 }
4017 \msg_new:nnn { enumext } { anspic-wrong-place }
4018 {
4019     Wrong ~ place ~ for ~ command ~ '\c_backslash_str #1' ~ \msg_line_context:.. \\
4020     '\c_backslash_str #1' ~ works ~ in ~ the ~ environment ~ '#2'.
4021 }
4022 \msg_new:nnn { enumext } { command-wrong-place }
4023 {
4024     Wrong ~ place ~ for ~ command ~ '\c_backslash_str #1' ~ \msg_line_context:.. \\
4025     '\c_backslash_str #1' ~ works ~ outside ~ the ~ environment ~ '#2'.
4026 }

```

Messages used by `keyans` and `keyanspic` environment.

```

4027 \msg_new:nnn { enumext } { keyans-nested }
4028 {
4029     The ~ environment ~ 'keyans' ~ can't ~ be ~ nested ~ \msg_line_context:.
4030 }
4031 \msg_new:nnn { enumext } { keyans-wrong-level }
4032 {
4033     Wrong ~ level ~ position ~ for ~ 'keyans' ~ \msg_line_context:.. \\
4034     The ~ environment ~ 'keyans' ~ can ~ only ~ be ~ in ~ the ~ first ~ level.
4035 }
4036 \msg_new:nnn { enumext } { wrong-place }
4037 {
4038     Wrong ~ place ~ for ~ '#1' ~ environment ~ \msg_line_context:.. \\
4039     '#1' ~ is ~ only ~ found ~ with ~ '#2' ~ in ~ 'enumext'.
4040 }
4041 \msg_new:nnn { enumext } { keyanspic-nested }
4042 {
4043     The ~ environment ~ 'keyanspic' ~ can't ~ be ~ nested ~ \msg_line_context:..
4044 }
4045 \msg_new:nnn { enumext } { keyanspic-wrong-level }
4046 {
4047     Wrong ~ level ~ position ~ for ~ 'keyanspic' ~ \msg_line_context:.. \\
4048     The ~ environment ~ 'keyans' ~ can ~ only ~ be ~ in ~ the ~ first ~ level.
4049 }

```

Messages used by \getkeyans command.

```

4050 \msg_new:nnn { enumext } { undefined-storage-anskey }
4051 {
4052     Storage ~ named ~ '#1' ~ is ~ not ~ defined ~ \msg_line_context:.
4053 }

```

Messages used by \miniright command.

```

4054 \msg_new:nnn { enumext } { missing-miniright }
4055 {
4056     Missing ~ '\c_backslash_str miniright' ~ in ~ \msg_line_context:.. \\
4057     The ~ key ~ 'mini-env' ~ need ~ '\c_backslash_str miniright'.
4058 }
4059 \msg_new:nnn { enumext } { wrong-miniright-place }
4060 {
4061     Wrong ~ place ~ for ~ '\c_backslash_str miniright' ~ \msg_line_context:.. \\
4062     Works ~ in ~ 'enumext' ~ and ~ 'keyans' ~ with ~ key ~ 'mini-env'.

```

```

4063     }
4064 \msg_new:nnn { enumext } { wrong-miniright-use }
4065 {
4066   Wrong ~ use ~ for ~ '\c_backslash_str miniright' ~ \msg_line_context:~ \\
4067   '\c_backslash_str miniright' ~ need ~ a ~ key ~ 'mini-env'.
4068 }

```

Messages used by `enumext*` and `keyans*` environments.

```

4069 \msg_new:nnn { enumext } { nested }
4070 {
4071   The ~ starred ~ environment ~ can't ~ be ~ nested ~ \msg_line_context:.
4072 }
4073 \msg_new:nnn { enumext } { item-joined }
4074 {
4075   Items ~ joined ~ (#1) ~ > ~ #2 ~ columns ~\msg_line_context:.
4076 }
4077 \msg_new:nnn { enumext } { item-joined-columns }
4078 {
4079   Not ~ space ~ to ~ join ~ items ~ (#1) ~ > ~ #2 ~\msg_line_context:.
4080 }

```

10.41 Finish package

Finish package implementation.

```

4081 \file_input_stop:
4082 </package>

```

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