

teachingtools — Environments and tools for teaching materials *

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Released ?

1 Implementation

```
1 <*package>
2 <@@=teachingtools>
```

1.1 Preliminaries

The usual preliminaries apply.

```
3 \ProvidesExplPackage {teachingtools} {2017/11/25} {v0.2}
4   {Environments and tools for teaching materials}
```

This package depends on recent versions of the l3kernel. Versions from TeXLive 2016 or newer should be fine.

```
5 \@ifpackagelater { expl3 } { 2015/11/15 }
6   { }
7   {
8     \PackageError { teachingtools } { Support~package~expl3~too~old }
9     {
10      You~need~to~update~your~installation~of~the~bundles~'l3kernel'~and~
11      'l3packages'.\MessageBreak
12      Loading~teachingtools~will~abort!
13    }
14    \tex_endinput:D
15  }
```

Now load the support packages. `chngcntr` is required to modify counters while they're in use, and `enumitem` provides convenience macros for modifying lists.

```
16 \RequirePackage{ l3keys2e , chngcntr , enumitem }
```

The package `cleveref` does some clever things with reference handling, but it needs a reference format defined for each type of thing we might choose to reference.

*This file describes ?, last revised ?.

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1.2 Messages and error handling

All of the error and warning messages are defined here in one place to simplify things.

```

17 \msg_new:nnnn { teachingtools } { unknown-option }
18   { Unknown~option~'#1'. }
19   {
20     The~option~'#1'~is~not~known~by~teachingtools:~
21     perhaps~it~is~spelled~incorrectly.
22   }

```

Some general-purpose functions for throwing errors are defined next.

```

\__teachingtools_error:nxx
\__teachingtools_error:nx
\__teachingtools_error:n
\l__teachingtools_error_bool
23 \cs_new_protected:Npn \__teachingtools_error:nxx #1#2#3 {
24   \bool_set_true:N \l__teachingtools_error_bool
25   \msg_error:nnxx { teachingtools } {#1} {#2} {#3}
26 }
27 \cs_new_protected:Npn \__teachingtools_error:nx #1#2 {
28   \__teachingtools_error:nxx {#1} {#2} { }
29 }
30 \cs_new_protected:Npn \__teachingtools_error:n #1 {
31   \__teachingtools_error:nxx {#1} { } { }
32 }
33 \bool_new:N \l__teachingtools_error_bool

```

(End definition for __teachingtools_error:nxx and others.)

\l__teachingtools_key_tl Unknown options should raise an teachingtools-specific error message.

```

34 \tl_new:N \l__teachingtools_key_tl
35 \keys_define:nn { teachingtools } {
36   unknown .code:n = {
37     \msg_error:nnx { teachingtools } { unknown-option }
38     { \exp_not:V \l_keys_key_tl }
39   }
40 }
41 \AtBeginDocument {
42   \keys_define:nn { teachingtools } {
43     unknown .code:n = {
44       \msg_error:nnx { teachingtools } { unknown-option }
45       { \exp_not:V \l_keys_key_tl }
46     }
47   }
48 }

```

(End definition for \l__teachingtools_key_tl.)

1.3 Printing routines

Some general-purpose printing routines are provided here to ensure that text can be printed with the necessary configuration.

_teachingtools_print_question: This function prints the question title, with or without numbering as required.

```

49 \cs_new:Nn \__teachingtools_print_question: {
50   \str_clear:N \l_tmpa_str
51   \bool_if:NT \l__teachingtools_numbered_question_bool {
52     \refstepcounter{question}

```

```

53   \str_put_left:Nn \l_tmpa_str { ~ }
54   \__teachingtools_print_question_label:
55   \str_put_right:Nx \l_tmpa_str { \l_tmpb_str }
56 }
57 \str_put_right:Nx \l_tmpa_str { \l__teachingtools_suffix_character_str }
58 \par \skip_vertical:N \questionbefore
59 \group_begin:
60 \bfseries Question\l_tmpa_str \par\nopagebreak
61 \group_end:
62 }

```

(End definition for __teachingtools_print_question:.)

__teachingtools_print_question_label This function prints out the question label.

```

63 \cs_new:Nn \__teachingtools_print_question_label: {
64   \str_clear:N \l_tmpb_str
65   \bool_if:NT \l__teachingtools_question_prefix_bool {
66     \str_put_right:Nx \l_tmpb_str { \l__teachingtools_question_prefix_tl }
67     \str_put_right:Nx \l_tmpb_str { \l__teachingtools_prefix_separator_str }
68   }
69   \str_put_right:Nx \l_tmpb_str { \l__teachingtools_question_label_tl }
70 }

```

(End definition for __teachingtools_print_question_label.)

__teachingtools_print_example: This function prints the example environment numbering string.

```

71 \cs_new:Nn \__teachingtools_print_example: {
72   \bool_if:NT \l__teachingtools_numbered_example_bool {
73     \refstepcounter{example}
74     \str_put_left:Nn \l_tmpa_str { ~ }
75     \bool_if:NT \l__teachingtools_example_prefix_bool {
76       \str_put_right:Nx \l_tmpa_str { \l__teachingtools_example_prefix_tl }
77       \str_put_right:Nx \l_tmpa_str { \l__teachingtools_prefix_separator_str }
78     }
79     \str_put_right:Nx \l_tmpa_str { \l__teachingtools_example_label_tl }
80   }
81   \str_put_right:Nx \l_tmpa_str { \l__teachingtools_suffix_character_str }
82   \par \skip_vertical:N \examplebefore
83   \group_begin:
84   \bfseries Example\l_tmpa_str \par\nopagebreak
85   \group_end:
86 }

```

(End definition for __teachingtools_print_example:.)

1.4 Resetting counters

\l__teachingtools_reset_question_tl The **reset** option provides a means for environment numbering to be reset at different sectioning “levels”. By default, question numbering is reset at the “section” level, and \l__teachingtools_reset_example_tl example numbering is not reset.

```

87 \newcounter{question}
88 \keys_define:nn { teachingtools / question } {
89   reset .default:n = section,
90   reset .choices:nn = {

```

```

91     part, chapter, section, subsection, subsubsection, paragraph, subparagraph
92   }
93   {
94     \counterwithin*{question}{ \tl_to_str:N \l_keys_choice_tl }
95   },
96   reset / none .code:n = {
97     \counterwithout*{question}{section}
98   },
99 }

100 \newcounter{example}
101 \keys_define:nn { teachingtools / example } {
102   reset .default:n = none,
103   reset .choices:nn = {
104     part, chapter, section, subsection, subsubsection, paragraph, subparagraph
105   }
106   {
107     \counterwithin*{example}{ \tl_to_str:N \l_keys_choice_tl }
108   },
109   reset / none .code:n = {
110     \counterwithout*{example}{section}
111   },
112 }

113 \keys_define:nn { teachingtools } {
114   reset .choice:,
115   reset / part .meta:n = {
116     question / reset = part,
117     example / reset = part
118   },
119   reset / chapter .meta:n = {
120     question / reset = chapter,
121     example / reset = chapter
122   },
123   reset / section .meta:n = {
124     question / reset = section,
125     example / reset = section
126   },
127   reset / subsection .meta:n = {
128     question / reset = subsection,
129     example / reset = subsection
130   },
131   reset / subsubsection .meta:n = {
132     question / reset = subsubsection,
133     example / reset = subsubsection
134   },
135   reset / paragraph .meta:n = {
136     question / reset = paragraph,
137     example / reset = paragraph
138   },
139   reset / subparagraph .meta:n = {
140     question / reset = subparagraph,
141     example / reset = subparagraph
142   },
143   reset / none .meta:n = {

```

```

144     question / reset = none,
145     example / reset = none
146 },
147 reset / false .meta:n = {
148     question / reset,
149     example / reset
150 },
151 reset .default:n = false,
152 reset .initial:n = false,
153 }

```

(End definition for `\l__teachingtools_reset_question_tl`, `\l__teachingtools_reset_example_tl`, and `\l__teachingtools_reset_all_tl`.)

`\l__teachingtools_numbered_question_bool` This local variable is used to toggle between numbered and unnumbered questions.

```

\l__teachingtools_numbered_example_bool
154 \bool_new:N \l__teachingtools_numbered_question_bool
155 \bool_new:N \l__teachingtools_numbered_example_bool

```

(End definition for `\l__teachingtools_numbered_question_bool` and `\l__teachingtools_numbered_example_bool`.)

`\l__teachingtools_question_number_int` The environment counters can be set to specific values using the `number` option. This is only really useful when passed as an optional argument to an environment instance; note that normal counter incrementing still applies for subsequent instances.

```

156 \keys_define:nn { teachingtools } {
157     question / number .code:n = {
158         \int_set_eq:NN \l_tmpa_int #1
159         \int_decr:N \l_tmpa_int
160         \setcounter{question}{ \int_use:N \l_tmpa_int }
161     },
162     example / number .code:n = {
163         \int_set_eq:NN \l_tmpa_int #1
164         \int_decr:N \l_tmpa_int
165         \setcounter{example}{ \int_use:N \l_tmpa_int }
166     },
167 }

```

(End definition for `\l__teachingtools_question_number_int` and `\l__teachingtools_example_number_int`.)

1.5 Formatting counters and labels

The label style of both environments can be set to any of the predefined counter styles: arabic, alphabetic, uppercase alphabetic, Roman numerals, uppercase Roman numerals, and footnote symbols. The latter style is provided but not recommended for use, and may be deprecated in a future version as it is of limited practical use.

The following features are planned but not yet implemented:

- **suffix:** The character to append after the counter
- **formatting of environment?** No idea how to do that

Each environment can have an optional prefix to precede the number with that of the specified sectioning level. Note that this implies resetting of the environment counter at the specified level, unless overridden by the `question / reset`, `example / reset`, or `reset` options. The default is none.

`\l__teachingtools_prefix_separator_tl` The `prefix-separator` is a character used to separate the environment numbering prefix from its number, if the prefix exists.

```

168 \str_new:N \l__teachingtools_prefix_separator_str
169 \keys_define:nn { teachingtools } {
170   prefix-separator .choice:,
171   prefix-separator / dash .code:n = {
172     \str_set:Nn \l__teachingtools_prefix_separator_str { - }
173   },
174   prefix-separator / dot .code:n = {
175     \str_set:Nn \l__teachingtools_prefix_separator_str { . }
176   },
177   prefix-separator / colon .code:n = {
178     \str_set:Nx \l__teachingtools_prefix_separator_str { \c_colon_str }
179   },
180   prefix-separator / none .code:n = {
181     \str_gclear:N \l__teachingtools_prefix_separator_str
182   },
183   prefix-separator .default:n = none,
184   prefix-separator .initial:n = none,
185 }

```

(End definition for `\l__teachingtools_prefix_separator_tl`.)

`\l__teachingtools_question_prefix_tl` The `question / prefix` sets the prefix for the question environment.
`\l__teachingtools_question_prefix_bool`

```

186 \tl_new:N \l__teachingtools_question_prefix_tl
187 \bool_new:N \l__teachingtools_question_prefix_bool
188 \keys_define:nn { teachingtools / question } {
189   prefix .choice:,
190   prefix / part .code:n = {
191     \tl_set:Nn \l__teachingtools_question_prefix_tl { \arabic{part} }
192     \keys_set:nn { teachingtools } {
193       question / reset = part,
194       prefix-separator = dash,
195     }
196     \bool_set_true:N \l__teachingtools_question_prefix_bool
197   },
198   prefix / chapter .code:n = {
199     \tl_set:Nn \l__teachingtools_question_prefix_tl { \arabic{chapter} }
200     \keys_set:nn { teachingtools } {
201       question / reset = chapter,
202       prefix-separator = dash,
203     }
204     \bool_set_true:N \l__teachingtools_question_prefix_bool
205   },
206   prefix / section .code:n = {
207     \tl_set:Nn \l__teachingtools_question_prefix_tl { \arabic{section} }
208     \keys_set:nn { teachingtools } {
209       question / reset = section,
210       prefix-separator = dash,
211     }
212     \bool_set_true:N \l__teachingtools_question_prefix_bool
213   },
214   prefix / subsection .code:n = {
215     \tl_set:Nn \l__teachingtools_question_prefix_tl { \arabic{subsection} }

```

```

216 \keys_set:nn { teachingtools } {
217     question / reset = subsection,
218     prefix-separator = dash,
219 }
220 \bool_set_true:N \l__teachingtools_question_prefix_bool
221 },
222 prefix / subsubsection .code:n = {
223     \tl_set:Nn \l__teachingtools_question_prefix_tl { \arabic{subsubsection} }
224     \keys_set:nn { teachingtools } {
225         question / reset = subsubsection,
226         prefix-separator = dash,
227     }
228     \bool_set_true:N \l__teachingtools_question_prefix_bool
229 },
230 prefix / paragraph .code:n = {
231     \tl_set:Nn \l__teachingtools_question_prefix_tl { \arabic{paragraph} }
232     \keys_set:nn { teachingtools } {
233         question / reset = paragraph,
234         prefix-separator = dash,
235     }
236     \bool_set_true:N \l__teachingtools_question_prefix_bool
237 },
238 prefix / subparagraph .code:n = {
239     \tl_set:Nn \l__teachingtools_question_prefix_tl { \arabic{subparagraph} }
240     \keys_set:nn { teachingtools } {
241         question / reset = subparagraph,
242         prefix-separator = dash,
243     }
244     \bool_set_true:N \l__teachingtools_question_prefix_bool
245 },
246 prefix / none .code:n = {
247     \tl_gclear:N \l__teachingtools_question_prefix_tl
248 },
249 prefix .default:n = none,
250 prefix .initial:n = none,
251 }

```

(End definition for \l__teachingtools_question_prefix_tl and \l__teachingtools_question_prefix_bool.)

\l__teachingtools_example_prefix_tl
\l__teachingtools_example_prefix_bool

The prefix sets the prefix for the example environment.

```

252 \tl_new:N \l__teachingtools_example_prefix_tl
253 \bool_new:N \l__teachingtools_example_prefix_bool
254 \keys_define:nn { teachingtools / example } {
255     prefix .choice:,
256     prefix / part .code:n = {
257         \tl_set:Nn \l__teachingtools_example_prefix_tl { \arabic{part} }
258         \bool_set_true:N \l__teachingtools_example_prefix_bool
259         \keys_set:nn { teachingtools } {
260             example / reset = part,
261             prefix-separator = dash,
262         }
263     },
264     prefix / chapter .code:n = {

```

```

265 \tl_set:Nn \l__teachingtools_example_prefix_tl { \arabic{chapter} }
266 \bool_set_true:N \l__teachingtools_example_prefix_bool
267 \keys_set:nn { teachingtools } {
268     example / reset = chapter,
269     prefix-separator = dash,
270 }
271 },
272 prefix / section .code:n = {
273     \tl_set:Nn \l__teachingtools_example_prefix_tl { \arabic{section} }
274     \bool_set_true:N \l__teachingtools_example_prefix_bool
275     \keys_set:nn { teachingtools } {
276         example / reset = section,
277         prefix-separator = dash,
278     }
279 },
280 prefix / subsection .code:n = {
281     \tl_set:Nn \l__teachingtools_example_prefix_tl { \arabic{subsection} }
282     \bool_set_true:N \l__teachingtools_example_prefix_bool
283     \keys_set:nn { teachingtools } {
284         example / reset = subsection,
285         prefix-separator = dash,
286     }
287 },
288 prefix / subsubsection .code:n = {
289     \tl_set:Nn \l__teachingtools_example_prefix_tl { \arabic{subsubsection} }
290     \bool_set_true:N \l__teachingtools_example_prefix_bool
291     \keys_set:nn { teachingtools } {
292         example / reset = subsubsection,
293         prefix-separator = dash,
294     }
295 },
296 prefix / paragraph .code:n = {
297     \tl_set:Nn \l__teachingtools_example_prefix_tl { \arabic{paragraph} }
298     \bool_set_true:N \l__teachingtools_example_prefix_bool
299     \keys_set:nn { teachingtools } {
300         example / reset = paragraph,
301         prefix-separator = dash,
302     }
303 },
304 prefix / subparagraph .code:n = {
305     \tl_set:Nn \l__teachingtools_example_prefix_tl { \arabic{subparagraph} }
306     \bool_set_true:N \l__teachingtools_example_prefix_bool
307     \keys_set:nn { teachingtools } {
308         example / reset = subparagraph,
309         prefix-separator = dash,
310     }
311 },
312 prefix / none .code:n = {
313     \tl_gclear:N \l__teachingtools_example_prefix_tl
314     \bool_set_false:N \l__teachingtools_example_prefix_bool
315 },
316 prefix .default:n = none,
317 prefix .initial:n = none,
318 }

```


(End definition for \l__teachingtools_example_prefix_tl and \l__teachingtools_example_prefix_bool.)

\l__teachingtools_question_label_tl The label on the question environment can be set using this key. The default is Arabic numerals, and the options `alph` and `roman` are aliases for `lower-alph` and `lower-roman`.

```

319 \tl_new:N \l__teachingtools_question_label_tl
320 \keys_define:nn { teachingtools / question } {
321   label .choice:,
322   label / arabic .code:n = {
323     \tl_set:Nn \l__teachingtools_question_label_tl { \arabic{question} }
324   },
325   label / alph .code:n = {
326     \tl_set:Nn \l__teachingtools_question_label_tl { \int_to_alph:n { \value{question} } }
327   },
328   label / lower-alph .code:n = {
329     \tl_set:Nn \l__teachingtools_question_label_tl { \int_to_alph:n { \value{question} } }
330   },
331   label / upper-alph .code:n = {
332     \tl_set:Nn \l__teachingtools_question_label_tl { \int_to_Alph:n { \value{question} } }
333   },
334   label / roman .code:n = {
335     \tl_set:Nn \l__teachingtools_question_label_tl { \roman{question} }
336   },
337   label / lower-roman .code:n = {
338     \tl_set:Nn \l__teachingtools_question_label_tl { \roman{question} }
339   },
340   label / upper-roman .code:n = {
341     \tl_set:Nn \l__teachingtools_question_label_tl { \Roman{question} }
342   },
343   label / footnote-symbol .code:n = {
344     \tl_set:Nn \l__teachingtools_question_label_tl { \fnsymbol{question} }
345   },
346   label .default:n = arabic,
347   label .initial:n = arabic,
348 }

```

(End definition for \l__teachingtools_question_label_tl.)

\l__teachingtools_example_label_tl The label on the example environment can be set using this key. The default is uppercase Latin characters; note that this presently implies a limit of 26 examples unless changed to a different label style.

```

349 \tl_new:N \l__teachingtools_example_label_tl
350 \keys_define:nn { teachingtools / example } {
351   label .choice:,
352   label / arabic .code:n = {
353     \tl_set:Nn \l__teachingtools_example_label_tl { \arabic{example} }
354   },
355   label / alph .code:n = {
356     \tl_set:Nn \l__teachingtools_example_label_tl { \int_to_alph:n { \value{example} } }
357   },
358   label / lower-alph .code:n = {
359     \tl_set:Nn \l__teachingtools_example_label_tl { \int_to_alph:n { \value{example} } }
360   },
361   label / upper-alph .code:n = {

```

```

362   \tl_set:Nn \l__teachingtools_example_label_tl { \int_to_Alph:n { \value{example} } }
363 },
364 label / roman .code:n = {
365   \tl_set:Nn \l__teachingtools_example_label_tl { \roman{example} }
366 },
367 label / lower-roman .code:n = {
368   \tl_set:Nn \l__teachingtools_example_label_tl { \roman{example} }
369 },
370 label / upper-roman .code:n = {
371   \tl_set:Nn \l__teachingtools_example_label_tl { \Roman{example} }
372 },
373 label / footnote-symbol .code:n = {
374   \tl_set:Nn \l__teachingtools_example_label_tl { \fnsymbol{example} }
375 },
376 label .default:n = upper-alpha,
377 label .initial:n = upper-alpha,
378 }

```

(End definition for \l__teachingtools_example_label_tl.)

\l__teachingtools_suffix_character_str The suffix-character is a character appended after the environment number.

```

379 \str_new:N \l__teachingtools_suffix_character_str
380 \keys_define:nn { teachingtools } {
381   suffix-character .choice:,
382   suffix-character / dot .code:n = {
383     \str_set:Nn \l__teachingtools_suffix_character_str { . }
384   },
385   suffix-character / colon .code:n = {
386     \str_set:Nx \l__teachingtools_suffix_character_str { \c_colon_str }
387   },
388   suffix-character / bracket .code:n = {
389     \str_set:Nx \l__teachingtools_suffix_character_str { ) }
390   },
391   suffix-character / none .code:n = {
392     \str_gclear:N \l__teachingtools_suffix_character_str
393   },
394   suffix-character .default:n = dot,
395   suffix-character .initial:n = dot,
396 }

```

(End definition for \l__teachingtools_suffix_character_str.)

1.6 Dimensions and lengths

A number of dimensions and lengths are used internally to define spacing around each environment. Each environment has its own skip length, initially set to the value of that for the `question` environment.

```

397 \skip_new:N \questionbefore
398 \skip_new:N \questionafter
399 \skip_new:N \answerbefore
400 \skip_new:N \answerafter
401 \skip_new:N \examplebefore
402 \skip_new:N \exampleafter
403 \skip_new:N \noticebefore

```

```

404 \skip_new:N \noticeafter
405
406 \skip_set:Nn \questionbefore { 1.0ex plus -1ex minus -0.25ex }
407 \skip_set:Nn \questionafter { 1ex plus 0.25ex }
408
409 \skip_set_eq:NN \answerbefore \questionbefore
410 \skip_set_eq:NN \examplebefore \questionbefore
411 \skip_set_eq:NN \noticebefore \questionbefore
412
413 \skip_set_eq:NN \answerafter \questionafter
414 \skip_set_eq:NN \exampleafter \questionafter
415 \skip_set_eq:NN \noticeafter \questionafter

```

1.7 Environments

This package defines a number of environments for teaching materials.

question The `\question` environment is used to create a list of questions. The starred version is unnumbered and does not increment the question counter.

```

416 \NewDocumentEnvironment { question } { s O { } } {
417   \group_begin:
418   \IfBooleanTF #1
419     { \bool_set_false:N \l__teachingtools_numbered_question_bool }
420     { \bool_set_true:N \l__teachingtools_numbered_question_bool }
421
422   \keys_set:nn { teachingtools / question } {#2}
423   \__teachingtools_print_question:
424
425   \begin{itshape}
426 }
427 {\end{itshape}\group_end: \par \skip_vertical:N \questionafter}
428 \cs_new:cpn {question*} {\question*}
429 \cs_new_eq:cN {endquestion*} \endquestion

```

answer The `\answer` environment is used to format the answer.

```

430 \NewDocumentEnvironment { answer } { s } {
431   \par\vspace\answerbefore
432   \setcounter{equation}{0}
433   { \bfseries Solution:\par\nopagebreak }
434 }
435 {\par\vspace\answerafter}
436 \cs_new:cpn {answer*} {\example*}
437 \cs_new_eq:cN {endanswer*} \endexample

```

example The `\example` environment is used to create a list of examples. The starred version is unnumbered and does not increment the example counter.

```

438 \NewDocumentEnvironment { example } { s O { } } {
439   \group_begin:
440   \IfBooleanTF #1
441     { \bool_set_false:N \l__teachingtools_numbered_example_bool }
442     { \bool_set_true:N \l__teachingtools_numbered_example_bool }
443
444   \keys_set:nn { teachingtools / example } {#2}

```

```

445   \_teachingtools_print_example:
446 }
447 {\group_end: \par\vspace\exampleafter}
448 \cs_new:cpn {example*} {\example*}
449 \cs_new_eq:cN {endexample*} \endexample

```

1.8 Document macros

The user document macros are all collected together here for ease.

`\ttsetup` The set-up macro simply moves to the correct path and executes whatever has been passed.

```

450 \NewDocumentCommand \ttsetup { m } {
451   \keys_set:nm { teachingtools } {#1}
452 }

```

(End definition for `\ttsetup`. This function is documented on page ??.)

1.9 Loading configuration

Apply the settings given at load time.

```

453 \ProcessKeysOptions { teachingtools }
454 \</package>

```

Change History

v0.1

General: First public testing release . . . 1

v0.2

General: Added support for
environment numbering prefixes . . . 1

v0.3a

General: Question and example
numbers can be set via options,
and the 26 instance limitation on
alphabetically-numbered
environments no longer applies. . . 1

Index

The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.

A	
<code>answer</code> (environment)	<u>430</u>
<code>\answer</code>	11
<code>\answerafter</code>	400, 413, <u>435</u>
<code>\answerbefore</code>	399, 409, <u>431</u>
<code>\arabic</code>	191,
	199, 207, 215, 223, 231, 239, 257,
	265, 273, 281, 289, 297, 305, 323, <u>353</u>
<code>\AtBeginDocument</code>	41
B	
<code>\begin</code>	425
<code>\bfseries</code>	60, 84, <u>433</u>
bool commands:	
<code>\bool_if:NTF</code>	51, 65, 72, 75
<code>\bool_new:N</code>	33, 154, 155, 187, <u>253</u>
<code>\bool_set_false:N</code>	314, 419, <u>441</u>
<code>\bool_set_true:N</code>	24, 196,
	204, 212, 220, 228, 236, 244, 258,
	266, 274, 282, 290, 298, 306, 420, <u>442</u>
C	
<code>\counterwithin</code>	94, 107
<code>\counterwithout</code>	97, <u>110</u>
cs commands:	
<code>\cs_new:Nn</code>	49, 63, 71
<code>\cs_new:Npn</code>	428, 436, <u>448</u>
<code>\cs_new_eq:NN</code>	429, 437, <u>449</u>
<code>\cs_new_protected:Npn</code>	23, 27, 30
E	
<code>\end</code>	427
<code>\endexample</code>	437, <u>449</u>
<code>\endquestion</code>	429
environments:	
<code>answer</code>	<u>430</u>
<code>example</code>	<u>438</u>
<code>question</code>	<u>416</u>
<code>example</code> (environment)	<u>438</u>
<code>\example</code>	11, 436, <u>448</u>
<code>\exampleafter</code>	402, 414, <u>447</u>
<code>\examplebefore</code>	82, 401, <u>410</u>
exp commands:	
<code>\exp_not:n</code>	38, <u>45</u>
F	
<code>\fnsymbol</code>	344, <u>374</u>
G	
group commands:	
<code>\group_begin:</code>	59, 83, 417, <u>439</u>
<code>\group_end:</code>	61, 85, 427, <u>447</u>
I	
<code>\IfBooleanTF</code>	418, <u>440</u>
int commands:	
<code>\int_decr:N</code>	159, 164
<code>\int_set_eq:NN</code>	158, 163
<code>\int_to_Alph:n</code>	332, 362
<code>\int_to_alph:n</code>	326, 329, 356, <u>359</u>
<code>\int_use:N</code>	160, 165
<code>\l_tmpa_int</code>	158, 159, 160, 163, 164, <u>165</u>
K	
keys commands:	
<code>\l_keys_choice_tl</code>	94, 107
<code>\keys_define:nn</code>	35, 42, 88, 101,
	113, 156, 169, 188, 254, 320, 350, <u>380</u>
<code>\l_keys_key_tl</code>	38, 45
<code>\keys_set:nn</code>	192, 200,
	208, 216, 224, 232, 240, 259, 267,
	275, 283, 291, 299, 307, 422, 444, <u>451</u>
M	
<code>\MessageBreak</code>	11
msg commands:	
<code>\msg_error:nnn</code>	37, <u>44</u>
<code>\msg_error:nnnn</code>	25
<code>\msg_new:nnnn</code>	17
N	
<code>\newcounter</code>	87, 100
<code>\NewDocumentCommand</code>	450
<code>\NewDocumentEnvironment</code>	416, 430, <u>438</u>
<code>\nopagebreak</code>	60, 84, <u>433</u>
<code>\noticeafter</code>	404, <u>415</u>
<code>\noticebefore</code>	403, <u>411</u>
P	
<code>\PackageError</code>	8
<code>\par</code>	58, 60, 82, 84, 427, 431, 433, 435, <u>447</u>
<code>\ProcessKeysOptions</code>	453
<code>\ProvidesExplPackage</code>	3
Q	
<code>question</code> (environment)	<u>416</u>
<code>\question</code>	11, <u>428</u>

<code>\questionafter</code>	398, 407, 413, 414, 415, 427	<code>\l__teachingtools_numbered_-</code>	
<code>\questionbefore</code>	58, 397, 406, 409, 410, 411	<code>question_bool</code>	... 51, 154, 419, 420
R			
<code>\refstepcounter</code>	... 52, 73	<code>\l__teachingtools_prefix_-</code>	
<code>\RequirePackage</code>	16	<code>separator_str</code>	... 67, 77, 168, 172, 175, 178, 181
<code>\Roman</code>	341, 371	<code>\l__teachingtools_prefix_-</code>	
<code>\roman</code>	335, 338, 365, 368	<code>separator_tl</code>	... 168
S			
<code>\setcounter</code>	160, 165, 432	<code>__teachingtools_print_example:</code>	... 71, 445
skip commands:		<code>__teachingtools_print_question:</code>	... 49, 423
<code>\skip_new:N</code>	... 397, 398, 399, 400, 401, 402, 403, 404	<code>__teachingtools_print_question_-</code>	
<code>\skip_set:Nn</code>	406, 407	<code>label</code>	... 63
<code>\skip_set_eq:NN</code>	... 409, 410, 411, 413, 414, 415	<code>__teachingtools_print_question_-</code>	
<code>\skip_vertical:N</code>	58, 82, 427	<code>label:</code>	... 54, 63
str commands:		<code>\l__teachingtools_question_-</code>	
<code>\c_colon_str</code>	178, 386	<code>label_tl</code>	... 69, 319
<code>\str_clear:N</code>	50, 64	<code>\l__teachingtools_question_-</code>	
<code>\str_gclear:N</code>	181, 392	<code>number_int</code>	... 156
<code>\str_new:N</code>	168, 379	<code>\l__teachingtools_question_-</code>	
<code>\str_put_left:Nn</code>	53, 74	<code>prefix_bool</code>	... 65, 186
<code>\str_put_right:Nn</code>	... 55, 57, 66, 67, 69, 76, 77, 79, 81	<code>\l__teachingtools_question_-</code>	
<code>\str_set:Nn</code>	172, 175, 178, 383, 386, 389	<code>prefix_tl</code>	... 66, 186
<code>\l_tmpa_str</code>	50, 53, 55, 57, 60, 74, 76, 77, 79, 81, 84	<code>\l__teachingtools_reset_all_tl</code>	... 87
<code>\l_tmpb_str</code>	55, 64, 66, 67, 69	<code>\l__teachingtools_reset_example_-</code>	
T			
teachingtools internal commands:		<code>tl</code>	... 87
<code>__teachingtools_error:n</code>	23	<code>\l__teachingtools_reset_question_-</code>	
<code>__teachingtools_error:nn</code>	23	<code>tl</code>	... 87
<code>__teachingtools_error:nnn</code>	23	<code>\l__teachingtools_suffix_-</code>	
<code>\l__teachingtools_error_bool</code>	23	<code>character_str</code>	... 57, 81, 379
<code>\l__teachingtools_example_label_-</code>		TeX and L ^A T _E X 2 _ε commands:	
<code>tl</code>	79, 349	<code>\@ifpackagelater</code>	... 5
<code>\l__teachingtools_example_-</code>		tex commands:	
<code>number_int</code>	156	<code>\tex_endinput:D</code>	14
<code>\l__teachingtools_example_-</code>		tl commands:	
<code>prefix_bool</code>	75, 252	<code>\tl_gclear:N</code>	247, 313
<code>\l__teachingtools_example_-</code>		<code>\tl_new:N</code>	34, 186, 252, 319, 349
<code>prefix_tl</code>	76, 252	<code>\tl_set:Nn</code>	191, 199, 207, 215, 223, 231, 239, 257, 265, 273, 281, 289, 297, 305, 323, 326, 329, 332, 335, 338, 341, 344, 353, 356, 359, 362, 365, 368, 371, 374
<code>\l__teachingtools_key_tl</code>	34	<code>\tl_to_str:N</code>	94, 107
<code>\l__teachingtools_numbered_-</code>		<code>\ttsetup</code>	450
<code>example_bool</code>	72, 154, 441, 442	V	
		<code>\value</code>	326, 329, 332, 356, 359, 362
		<code>\vspace</code>	431, 435, 447