ccool, a package for encoding mathematical notation*

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Abstract

ccool is a package for LaTeX, for encoding mathematical definitions in macros that retain the meaning thereof (`\R` rather than `$\mathbb{R}$`), the idea behind cool[2]. However, here, it is entirely up to the user to define these macros, hence the prefix 'c'[ustom]. This is done using a minimalist interface built upon xparse[4]. Specifically, `\Ccool<`⟨*object*⟩`>` begins a series of instructions alternating between 'text' and definitions, that themselves optionally expand using predefined or inline rules. For example,

```
\Ccool<Math>[Let~]{Space=\Omega}*[~denote the sample space]{}
```

expands to: "Let Ω denote the sample space". As a side effect, `$\Space<Math>$` encodes"Ω". `Math` being the default for ⟨*object*⟩, it can be dropped. Optionally, the definitions can be written to a file, and restored, which can be useful for typesetting documents sharing the same notational conventions.

Contents

*This file describes version v1.6, last revised 2020/04/10.

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Part I
Usage

Convention

1. Loosely, those of [3] and [4], for example as to the meaning of ⟨*token list*⟩.
2. If unspecified, the environment in which a function must be declared is `document`.
3. Where ⟨tl_1⟩ is an optional argument, its default is `Math`.

`\usepackage` `\usepackage{ccool}`

Environment *preamble*

Requirement `ccool.sty` is in the path of the LaTeX engine. See Part III, section 4.

`\Ccool`
```
\Ccool<⟨tl1⟩>
[⟨tl2⟩]
i{⟨code1⟩}
{⟨kvl1⟩}
+
*
s{{⟨tl3⟩}|{⟨tl3⟩}{⟨tl4⟩}|{⟨tl3⟩}{⟨tl4⟩}{⟨tl5⟩}}
o{⟨code2⟩}
[⟨tl6⟩]
```

Requirement ⟨kvl_1⟩ is specified (all others optional).

⟨tl_1⟩

Example `Math`, `ModelA`, `ModelB`

Semantics Registers a new object, if applicable

⟨*tl*$_2$⟩

Example `Let~`

Semantics Expands ⟨*tl*$_2$⟩

⟨*code*$_1$⟩

Example `\mathbb{#1}`

Semantics 1. ⟨*val*$_i$⟩ ← ⟨*code*$_1$⟩ applied to ⟨*val*$_i$⟩

⟨*kvl*$_1$⟩

Example `Elems={\omega_1, \dots, \omega_n}, Sample=\Omega`

Semantics 2. `\`⟨*key*$_i$⟩`<`⟨*tl*$_1$⟩`>` ← ⟨*val*$_i$⟩ defined in step 1, using subsection 6.2 for expansion.

3. If `Write=\BooleanTrue`, writes the definitions made in step 2 to file `ccool`⟨*digits*⟩`.tex`, where ⟨*digits*⟩=`\pdfcreationdate`

`+`

Other Needed to make `\Ccool`'side effect within a *local group* persist thereafter

Semantics Appends step 2 and step 3 to `\CcoolHook`

`*`

Semantics 5. Expands ⟨*code*$_2$⟩ applied to the list created in step 1, using the separator specified by subsubsection 2.7.1, subsubsection 2.7.2, subsubsection 2.7.3.

⟨*tl*$_3$⟩

Example `{~\in~}`

⟨*tl*$_4$⟩

Example `{,~}`

⟨*tl*$_5$⟩

Example `{~\&~}`

⟨*code*$_2$⟩

Example `$\left\{#1\right\}$`

⟨*tl*$_6$⟩

Semantics `\Ccool<`⟨*tl*$_1$⟩`>[`⟨*tl*$_6$⟩`]`

`\CcoolClear` `\CcoolClear<`⟨*keyval list*⟩`>`

Semantics Clears any data created by `\Ccool{`⟨tl_1⟩`}`, for all ⟨tl_1⟩ in ⟨*keyval list*⟩

`\CcoolDebug`

Semantics See Part IV

`\CcoolHook` `\CcoolHook`

Example `\AfterEndEnvironment{theorem}{\CcoolHook}`

Tip Add as many hooks after the local group as there are calls to `{`⟨kvl_1⟩`}+` within

`\CcoolOption` `\CcoolOption{`⟨*kvl0*⟩`}`

Semantics Set default options for section 2

`Expans`

Default `xo`

Syntax Either of `eo, ee, ex, xe, xo, xe, xx`

`File`

Syntax *Token*

`Inner`

Semantics Default for subsection 2.3

Syntax Use `####1` as the argument to be replaced

`Name`

Semantics Default for subsection 2.1

`Outer`

Semantics Default for subsection 2.8

Syntax Use `####1` as the argument to be replaced

`Separ`

Semantics Default for subsection 2.7

Syntax That of 'separators' in [3, Section 8 of l3seq]

`Write`

Syntax *Boolean*

\CcoolRead `\CcoolRead[`⟨*path*⟩`]`

Other The default for ⟨*path*⟩ is the last write-file (see ⟨kvl_1⟩)

Semantics 1. Reads the definitions in ⟨*path*⟩.

2. Writes to `ccool.log`: 'read from ⟨*path*⟩'

Do's and dont's

1.

Don't: `\Ccool{ A = a, B = b }[Hello, world!]`.

Do: `\Ccool{ A = a, B = b }[Hello, world!]{}`, or
`\Ccool{ A = a, B = b } Hello, world!`

2.

Don't: `$\`⟨key_i⟩`<x$`.

Do: `$\`⟨key_i⟩`{<}x$`

3.

Don't: `\Ccool[`[a, b)`]`.

Do: `\Ccool{{[}a, b{)}}`

4.

Don't: `\Ccool{ F = \cal F }`.

Do: `\Ccool{ F = \cal{F} }` or `\Ccool{ F = \mathcal{F} }`

5. Also see Part III, section 3

Part II
Listing

Listing 1 is what might be needed to replicate the code within subsequent listings. Check the documentation portion of the source file, `ccool.dtx`, for exhaustive settings.

Listing 1.

```
%     \usepackage{amsmath, amsthm, commath}
%     \usepackage[T1]{fontenc}% \char`[
%
```

Listing 2.

```
%     \CcoolOption{
%     ^^A% spaces betw. inner and outer brackets matter!->
%     Separ={{\ \char`@\ }{\ \%\ }{\ \char`@\ }}}
%     \Ccool<Test>{ X = x, Y = y }*[\\]
%     { X = x, Y = y, Z = z }*[\\]
%     { X = x, Y = y }*s{{\ \&\ }}[\\]
%     { X = x, Y = y }*s{{\ \&\ }{,\ }}[\\]
%     { X = x, Y = y, Z = z }*s{{\ \&\ }}[\\]
%     { X = x, Y = y, Z = z }*s{{\ \&\ }{,\ }}[\\]
%     { X = x, Y = y, Z = z }*s{{\ \&\ }{,\ }{\ \&\ }}\\
%
```

$x \mathbin{@} y$
$x \mathbin{\%} y \mathbin{@} z$
$x \mathbin{\&} y$
$x \mathbin{\&} y$
$x \mathbin{\&} y \mathbin{\&} z$
$x, y \mathbin{\&} z$
$x, y \mathbin{\&} z$

Listing 3.

```
%     \CcoolOption{ Separ = {{}{.}{.}}, Outer = {####1} }
%     \CcoolOption{ Write = \BooleanTrue }
%     \Ccool<Test>
%     { KeyA = {.}, KeyB = {!}, KeyC = {\%} }[]
%     { KeyD = {d}, KeyE = {\%} }[]i{\{#1\}}
%     { KeyF = {H}, KeyG = {e}, KeyH = {l} }*[]
%     { KeyI = {\%}, KeyJ = {\%}, KeyK = {\%} }[.\{l\}.\{o\}]
%     { KeyL = {l}, KeyM = {\char`[}, KeyN = {\char`]} }[]
%     { KeyO = {o}, KeyP = {\%}, KeyQ = {\%} }[{,\ }]
%     { KeyR = {w}, KeyS = {o}, KeyT = {r} }*s{{}{}{}}o{{\char`[}#1}[]
%     { KeyU = {\%}, KeyV = {\%}, KeyW = {\%} }[]
%     { KeyX = {\%}, KeyY = {\%}, KeyZ = {\KeyB<Test>} }\nobreak
%     \KeyL<Test>\KeyD<Test>\KeyZ<Test>\KeyN<Test>\\
```

```
%     \CcoolOption{ Write = \BooleanFalse }
%
```

{H}.{e}.{l}.{l}.{o}, [world!]

Listing 4.

```
%     \CcoolRead
%     \KeyF<Test>\KeyA<Test>\nobreak
%     \KeyG<Test>\KeyA<Test>\nobreak
%     \KeyH<Test>\KeyA<Test>\nobreak
%     \KeyH<Test>\KeyA<Test>\nobreak
%     {\{}\nobreak\KeyO<Test>{\}},{\ }\nobreak
%     \KeyM<Test>\KeyR<Test>\nobreak
%     \KeyO<Test>\nobreak
%     \KeyT<Test>\nobreak
%     \KeyL<Test>\nobreak
%     \KeyD<Test>\nobreak
%     \KeyZ<Test>\nobreak
%     \KeyN<Test>\nobreak
%
```

{H}.{e}.{l}.{l}.{o}, [world!]

Listing 5.

```
%     \Ccool[We call~]{Elems={{\omega_{1}}, {\dots}, {\omega_{n}}}}*
%     [~the elementary events, and ]{Space=\Omega}
%     [\begin{equation*}\Space=(\Elems)\end{equation*}~the sample space.]
%     {}
%
```

We call $\omega_1, \ldots, \omega_n$ the elementary events, and

$$\Omega = (\omega_1, \ldots, \omega_n)$$

the sample space.

Listing 6.

```
%     \CcoolOption{ Write = \BooleanTrue }
%     \Ccool[Let~]
%     {Space=\Omega, Field=\mathcal{F}, Meas=\mathcal{P}}
%     *s{{,}}o{$\{#1\}$}
%     [~denote the probability space, where $\Field\subset 2^{\Space}$.]
%     {}
%     \CcoolOption{ Write = \BooleanFalse }
%
```

Let $\{\Omega, \mathcal{F}, \mathcal{P}\}$ denote the probability space, where $\mathcal{F} \subset 2^{\Omega}$.

Listing 7.

```
%           \CcoolRead \tab $\Omega$ $\Field$ $\Meas$
%
```

$\Omega\ \mathcal{F}\ \mathcal{P}$

Listing 8.

```
%       \CcoolOption{ Write = \BooleanTrue }
%       \newtheorem{theorem}{Theorem}
%       \AfterEndEnvironment{theorem}{\CcoolHook}
%       \Ccool i{\mathbb{#1}}
%       { N = { N } , R = { R } }+[]
%       { Grad = { \operatorname{grad} } }+
%       [\begin{theorem}
%         [Mittelwertsatz f\"ur $n$ Variable]Es~sei~]
%         { OffMenge = {D}, Ci = {C^{1}}, Strecke = { [x_0,x] } }+
%         [$n\in\N$,~$\OffMenge\subseteq\N^n$ eine offene Menge und
    $f\in\Ci(\OffMenge,\R)$.
%         Dann gibt es auf jeder Strecke $\Strecke\subset\OffMenge$ einen
    Punkt $\xi\in\Strecke$,~]
%         { Steig = { \frac{ f(x)-f(x_0) }{ x-x_0 } }, Punkt = { \xi } }+
%         [so dass gilt
%         \begin{equation*}
%           \Steig = \Grad f(\Punkt)^{\top}
%         \end{equation*}
%       \end{theorem}]
%       {}
%       (Check: $\Punkt$)
%       \CcoolOption{ Write = \BooleanFalse }
%
```

Theorem 1 (Mittelwertsatz für n Variable) *Es sei $n \in \mathbb{N}$, $D \subseteq \mathbb{N}^n$ eine offene Menge und $f \in C^1(D, \mathbb{R})$. Dann gibt es auf jeder Strecke $[x_0, x] \subset D$ einen Punkt $\xi \in [x_0, x]$, so dass gilt*

$$\frac{f(x) - f(x_0)}{x - x_0} = \operatorname{grad} f(\xi)^{\top}$$

(Check: ξ)

Listing 9.

```
%       \CcoolRead \tab $\N$ $\R$ $\OffMenge$ $\Ci$ $\Strecke$
%
```

$\mathbb{N}\ \mathbb{R}\ D\ C^1\ [x_0, x]$

Part III
Other

1 Acknowledgment

This work has benefited from Q&A's from the LaTeXcommunity, see here: https://tex.stackexchange.com/users/112708/erwann?tab=questions. Specific references are made in Part IV. Listing 5 and Listing 6 are from [1]. Listing 8 is from tcolbox[5, 17.3].

2 Install

Compiling `ccool.dtx` (under Unix, `$tex ccool.dtx`) will generate `ccool.sty` and `ccool.pdf`

3 Issue

1. **Don't:** `Inner={\{####1\}`

   Symptom: `\CcoolRead` fails

   Do: `Inner={\char‘{####1\char‘}}`

4 Support

This package is available from https://www.ctan.org/pkg/ccool and https://github.com/rogard/ccool.

5 Testing

It's not possible to check the expansion of a certain class of macros against predefined values[6]. Instead, one can check that Part II, as generated in section 2 on one's own machine, agrees with `bench.pdf` available at https://github.com/rogard/ccool,

References

[1] A.N. Shiryaev *Probability* Springer, 1995

[2] Nick Setzer *The cool package*, 2005 https://www.ctan.org/pkg/cool

[3] The LaTeX3 Project Team *The LaTeX3 interfaces* http://ftp.math.purdue.edu/mirrors/ctan.org/macros/latex/contrib/l3kernel/interface3.pdf

[4] The LaTeX3 Project Team *The xparse package* http://ftp.math.purdue.edu/mirrors/ctan.org/macros/latex/contrib/l3packages/xparse.pdf

[5] Thomas F. Sturm *The tcolorbox package* http://www.texdoc.net/texmf-dist/doc/latex/tcolorbox/tcolorbox.pdf

[6] https://tex.stackexchange.com/a/534100/112708

Part IV
Implementation

```
⟨@@=ccool⟩
\NeedsTeXFormat{LaTeX2e}[2019/10/01]
\ExplSyntaxOn
```

1 aux

`\__ccool_aux_inner_set:n` #1 : ⟨*code*⟩

```
\cs_new_protected:Nn \__ccool_aux_inner_set:n
{
  \cs_gset:Npn \__ccool_aux_inner:n ##1 {#1}
  \cs_generate_variant:Nn \__ccool_aux_inner:n { e }
}
```

(*End definition for* `\__ccool_aux_inner_set:n`.)

`\__ccool_aux_key:w` #1 : ⟨ *key* ⟩
#2 : ⟨ *value* ⟩

```
\cs_new_protected:Npn \__ccool_aux_key:w #1 = #2 \q_stop
{
  \seq_gput_right:Nx \g__ccool_aux_key_seq { \tl_trim_spaces:n{#1} }
}
```

(*End definition for* `\__ccool_aux_key:w`.)

`\__ccool_aux_key:n` #1 : ⟨ *key* = *value* ⟩

```
\cs_new_protected:Nn \__ccool_aux_key:n
{
  \__ccool_aux_key:w #1 \q_stop
}
```

(*End definition for* `\__ccool_aux_key:n`.)

`\__ccool_aux_key:N` #1 : ⟨ *seq* ⟩

```
\cs_new_protected:Nn \__ccool_aux_key:N
{
  \seq_gclear_new:N \g__ccool_aux_key_seq
  \seq_map_function:NN #1 \__ccool_aux_key:n
}
```

(*End definition for* `\__ccool_aux_key:N`.)

`\__ccool_aux_outer_set:n` #1 : ⟨ *inline code* ⟩

```
\cs_new_protected:Nn \__ccool_aux_outer_set:n
{
  \cs_gset:Npn \__ccool_aux_outer:n ##1 {#1}
}
```

(*End definition for* `\__ccool_aux_outer_set:n`.)

__ccool_aux_prop:nn

```
\prop_new:N \g__ccool_aux_prop
\cs_new_protected:Nn \__ccool_aux_prop:nn
{
  \prop_gput:Nnn \g__ccool_aux_prop{#1}{#2}
}
\cs_generate_variant:Nn \__ccool_aux_prop:nn { eo, ee, ex, xo, xe, xx }
```

(*End definition for* `\__ccool_aux_prop:nn`.)

__ccool_aux_prop:w

#1 : ⟨ *key* ⟩
#2 : ⟨ *value* ⟩

```
\tl_new:N \g__ccool_option_expans_tl
\cs_new_protected:Npn \__ccool_aux_prop:w #1 = #2 \q_stop
{
  \exp_args:Nx
  \use:c{__ccool_aux_prop:\g__ccool_option_expans_tl}
  { \tl_trim_spaces:n{#1} }
  { \__ccool_aux_inner:n{ \tl_trim_spaces:n{#2} } }
%^^A  { \__ccool_aux_inner:e{ \tl_trim_spaces:n{#2} } }% DEBUG
}
```

(*End definition for* `\__ccool_aux_prop:w`.)

__ccool_aux_prop:n

#1 : ⟨ *key* = *value* ⟩

```
\cs_new_protected:Nn \__ccool_aux_prop:n
{
  \__ccool_aux_prop:w #1 \q_stop
}
```

(*End definition for* `\__ccool_aux_prop:n`.)

__ccool_aux_prop:N

#1 : ⟨*keyval list*⟩

```
\cs_new_protected:Nn \__ccool_aux_prop:N
{
  \prop_gclear_new:N \g__ccool_aux_prop
  \seq_if_empty:NTF #1
  { \c_empty_tl }
  {
    \seq_map_function:NN #1 \__ccool_aux_prop:n
  }
}
```

(*End definition for* `\__ccool_aux_prop:N`.)

__ccool_aux_separ:nn

#1 : ⟨ *int* ⟩
#2 : ⟨ *tokens* ⟩

```
\cs_new:Nn \__ccool_aux_separ:nn
{
  \int_case:nnTF {#1}
  {
    {1}
    { \prg_replicate:nn{ 3 }{#2} }
    {2}
```

```
    {
      { \use_i:nn #2 }
      { \use_ii:nn #2 }
      { \use_i:nn #2 }
    }
    {3}{#2}
  }
  { \c_empty_tl }
  {
    \msg_error:nnnn { __erw }
    { separ }
    { \exp_not:N \__ccool_aux_separ:nn }
    {#2}
  }
}
\cs_generate_variant:Nn \__ccool_aux_separ:nn { e }
```

(*End definition for* `\__ccool_aux_separ:nn`.)

`\__ccool_aux_separ:n` #1 : ⟨ *tokens* ⟩

```
\cs_new:Nn \__ccool_aux_separ:n
{
  \__ccool_aux_separ:en{ \tl_count:n{#1} }{#1}
}
```

(*End definition for* `\__ccool_aux_separ:n`.)

`\__ccool_aux_val:Nn` #1 : ⟨ *seq* ⟩
#2 : ⟨ *tl var name* ⟩

```
\cs_new_protected:Nn \__ccool_aux_val:Nn
{
  \seq_gclear_new:N \g__ccool_aux_val_seq
  \__ccool_seq_from_prop:NNn \g__ccool_aux_val_seq #1 { \__ccool_prop_name:n{#2} }
}
```

(*End definition for* `\__ccool_aux_val:Nn`.)

2 log

`\__ccool_log_close:`

```
\iow_new:N \g__ccool_log_iow
\AtEndDocument{\iow_close:N \g__ccool_log_iow}
\bool_set_false:N \g__ccool_log_open_bool
\cs_new_protected:Nn \__ccool_log_close:
{
  \iow_close:N \g__ccool_log_iow
  \bool_gset_false:N \g__ccool_log_open_bool
}
```

(*End definition for* `\__ccool_log_close:`.)

__ccool_log_open:

```
\tl_new:N \g__ccool_log_file_tl
\cs_new_protected:Nn \__ccool_log_open:
{
  \tl_gset:Nx \g__ccool_log_to_tl{\g__ccool_log_file_tl}
  \iow_open:Nn \g__ccool_log_iow {\g__ccool_log_to_tl}
  \bool_gset_true:N \g__ccool_log_open_bool
}
```

(*End definition for* `\__ccool_log_open:`.)

__ccool_log_read:n #1 : ⟨*path*⟩

```
\cs_new_protected:Nn \__ccool_log_read:n
{
  \file_input:n{#1}
  \tl_log:n{read~from~#1}
}
\cs_generate_variant:Nn \__ccool_log_read:n { e }
```

(*End definition for* `\__ccool_log_read:n`.)

__ccool_log_read:

```
\cs_new_protected:Nn \__ccool_log_read:
{
  \__ccool_log_read:e{\g__ccool_log_to_tl}
}
```

(*End definition for* `\__ccool_log_read:`.)

__ccool_log_write:n

```
\tl_new:N \g__ccool_log_to_tl
\cs_new_protected:Nn \__ccool_log_write:n
{
  \bool_if:nTF{ \g__ccool_log_open_bool }
  {
    \iow_now:Nn \g__ccool_log_iow {#1}
    \tl_log:n{ write~to~#1 }
  }
  { \msg_error:nnn{ __ccool }{ iow }{ \g__ccool_log_iow }  }
}
\cs_generate_variant:Nn \__ccool_log_write:n { e }
```

(*End definition for* `\__ccool_log_write:n`.)

3 make_key

__ccool_make_key:Nn #1 : ⟨ *token* ⟩
#2 : ⟨ *key* ⟩

```
\cs_new_protected:Nn \__ccool_make_key:Nn
{
  \exp_args:NNx
  \ProvideDocumentCommand{#1}
  { D<>{\g__ccool_option_name_tl} }
```

```
    {
      \__ccool_prop_item:nn{##1}{#2}
    }
  }
  \cs_generate_variant:Nn \__ccool_make_key:Nn {c}
```

(*End definition for* `\__ccool_make_key:Nn`.)

`\__ccool_make_key:n` `#1` : ⟨ *key* ⟩

```
  \cs_new_protected:Nn \__ccool_make_key:n
  {
    \__ccool_make_key:cn{#1}{#1}
  }
  \cs_generate_variant:Nn \__ccool_make_key:n { e }
```

(*End definition for* `\__ccool_make_key:n`.)

`\__ccool_make_key:N` `#1` : ⟨ *seq* ⟩

```
  \cs_new_protected:Nn \__ccool_make_key:N
  {
    \seq_map_function:NN #1 \__ccool_make_key:e
  }
```

(*End definition for* `\__ccool_make_key:N`.)

4 make_ccool

`\__ccool_make_ccool_exp:nnn`

```
  \cs_new_protected:Nn \__ccool_make_ccool_exp:nnn
  {
    \__ccool_aux_val:Nn \g__ccool_aux_key_seq {#1}
    \__ccool_aux_outer_set:n{#3}
    \__ccool_aux_outer:n
    {
      \exp_args:NNf
      \__ccool_seq_use:Nn
      \g__ccool_aux_val_seq
      {#2}
    }
  }
```

(*End definition for* `\__ccool_make_ccool_exp:nnn`.)

`\__ccool_make_ccool_key:nnn`

```
  \cs_new_protected:Nn \__ccool_make_ccool_key:nnn
  {
    \__ccool_prop_if_exist:nTF{#1}
    { \c_empty_tl }
    { \__ccool_prop_new:n{#1} }
    \exp_args:No \__ccool_aux_inner_set:n{#2}
    \seq_set_from_clist:Nn \g__ccool_aux_keyval_seq {#3}
    \__ccool_aux_prop:N \g__ccool_aux_keyval_seq
    \__ccool_prop_append:Nn \g__ccool_aux_prop {#1}
```

```
  \__ccool_aux_key:N \g__ccool_aux_keyval_seq
  \__ccool_make_key:N \g__ccool_aux_key_seq
}
```

(*End definition for* `\__ccool_make_ccool_key:nnn`.)

`\__ccool_make_ccool_sideeffect:nnn`

```
\cs_new_protected:Nn \__ccool_make_ccool_sideeffect:nnn
{
  \__ccool_make_ccool_key:nnn{#1}{#2}{#3}
  \bool_if:nTF{ \g__ccool_log_open_bool }
  {%^^A https://tex.stackexchange.com/questions/536597
    \__ccool_log_write:n
    {
      \begingroup
      \def \__ccool_log_entry { \Ccool<#1>i{#2}{#3} } \expandafter
      \endgroup \__ccool_log_entry
    }
  }{\c_empty_tl}
}
```

(*End definition for* `\__ccool_make_ccool_sideeffect:nnn`.)

`\__ccool_make_ccool:nnnn`

#1 : ⟨ *token list* ⟩
#2 : ⟨ seq_1 ⟩
#3 : ⟨ seq_2 ⟩
#4 : ⟨ *prop* ⟩

```
\def\CcoolHook{\c_empty_tl}
\cs_new_protected:Npn \__ccool_make_ccool:nnnn #1 #2 #3 #4
{
  \exp_args:NNx \DeclareDocumentCommand \Ccool
  {%^^A      2    3         4 5  6    7 8              9
    D<>{#1} +o E{ i }{{#2}} m t+ s E{ s o }{{#3}{#4}} +o
  }
  {
    \IfValueT{##2}{##2}
    \__ccool_make_ccool_sideeffect:nnn{##1}{##3}{##4}
    \IfBooleanT{##6}
    {
      \__ccool_make_ccool_exp:nnn{##1}{##7}{##8}
    }
    \bool_if:nTF{##5}
    {
      \gappto{\CcoolHook}
      {
        \__ccool_make_ccool_sideeffect:nnn{##1}{##3}{##4}
      }
    }
    {\c_empty_tl}
    \IfValueT{##9}
    {
      \exp_not:n{ \Ccool<##1>[##9] }
    }
  }
}
```

(*End definition for* `\__ccool_make_ccool:nnnn`.)

5 msg

```
\msg_new:nnn {__ccool}{ generic }{#1}
\msg_new:nnn {__ccool}{ iow }{#1~is~closed~can't~write}
\msg_new:nnn {__ccool}{ keyonly }{#1~does~not~take~values;~keyval~is~#2}
\msg_new:nnn {__ccool}{ keywrong }{#1~does~not~recognize~key~#2}
\msg_new:nnn {__ccool}{ separ }{#1~expects~1~to~3~items,~#2}
\msg_new:nnn {__ccool}{ unset }{#1~unset}
```

6 option

`\__ccool_aux_inner:n` `#1` : ⟨*code*⟩

```
\cs_new_protected:Nn \__ccool_option_inner:n
{
  \tl_gset:Nn \g__ccool_option_inner_tl {#1}
}
\__ccool_option_inner:n
{
  \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g__ccool_option_inner_tl }
}
```

(*End definition for* `\__ccool_aux_inner:n`.)

`\__ccool_option_name:n` `#1` : ⟨*token list*⟩

```
\cs_new:Nn \__ccool_option_name:n
{
  \tl_gset:Nn \g__ccool_option_name_tl{#1}
}
\__ccool_option_name:n
{
  \msg_error:nnx{ __ccool }
  { generic }
  { \exp_not:N\g__ccool_option_name_tl~undefined }
}
```

(*End definition for* `\__ccool_option_name:n`.)

`\__ccool_option_outer:n` `#1` : ⟨ *inline code* ⟩

```
\cs_new_protected:Nn \__ccool_option_outer:n
{
  \tl_gset:Nn \g__ccool_option_outer_tl {#1}
}
\__ccool_option_outer:n
{
  \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g__ccool_option_outer_tl }
}
```

(*End definition for* `\__ccool_option_outer:n`.)

__ccool_option_separ:n #1 : {⟨ tl_1 ⟩}{⟨ tl_2 ⟩}{⟨ tl_3 ⟩}

```
\cs_new_protected:Nn \__ccool_option_separ:n
{
  \cs_gset:Npn \g__ccool_option_separ_tl {#1}
}
\__ccool_option_separ:n
{
  \msg_warning:nnn{ __ccool }{ unset }{ \exp_not:N \g__ccool_option_separ_tl }
}
```

(*End definition for* `\__ccool_option_separ:n`.)

7 prop

__ccool_prop_append:NN #1 : ⟨ $prop_1$ ⟩
#2 : ⟨ $prop_2$ ⟩

```
\cs_new_protected:Npn \__ccool_prop_append:NN #1 #2
{
  \cs_set:Nn \__ccool_prop_append:nn
  {
    \prop_gput:Nnx #1 {##1}{ \prop_item:Nn #2{##1} }
  }
  \prop_map_function:NN #2 \__ccool_prop_append:nn
}
\cs_generate_variant:Nn \__ccool_prop_append:NN { cN }
```

(*End definition for* `\__ccool_prop_append:NN`.)

__ccool_prop_append:Nn #1 : ⟨ *prop* ⟩
#2 : ⟨ *tl var name* ⟩

```
\cs_new_protected:Nn \__ccool_prop_append:Nn
{
  \__ccool_prop_append:cN{ \__ccool_prop_name:n {#2} } #1
}
```

(*End definition for* `\__ccool_prop_append:Nn`.)

__ccool_prop_clear_new:n #1 : ⟨ *tl var name* ⟩

```
\cs_new_protected:Nn \__ccool_prop_clear_new:n
{
  \exp_args:No \prop_clear_new:c{ \__ccool_prop_name:n {#1} }
}
```

(*End definition for* `\__ccool_prop_clear_new:n`.)

__ccool_prop_clear_new_map:n #1 : ⟨ *keyval list* ⟩

```
\cs_new_protected:Nn \__ccool_prop_clear_new_map:n
{
  \seq_set_from_clist:Nn \g__ccool_aux_key_seq {#1}
  \seq_map_function:NN \g__ccool_aux_key_seq \__ccool_prop_clear_new:n
}
```

(*End definition for* `\__ccool_prop_clear_new_map:n`.)

__ccool_prop_if_exist:nTF
#1 : $\langle tl_1 \rangle$
#2 : $\langle tl_2 \rangle$
#3 : $\langle tl_3 \rangle$

```
\cs_new:Nn \__ccool_prop_if_exist:nTF
{
  \prop_if_exist:cTF{ \__ccool_prop_name:n {#1} }{#2}{#3}
}
```

(*End definition for* `\__ccool_prop_if_exist:nTF`.)

__ccool_prop_item:nn
#1 : ⟨ *tl var name* ⟩
#2 : ⟨ *key* ⟩

```
\cs_new:Nn \__ccool_prop_item:nn
{
  \prop_item:cn { \__ccool_prop_name:n {#1} } {#2}
}
```

(*End definition for* `\__ccool_prop_item:nn`.)

__ccool_prop_name:n
#1 : ⟨ *tl var name* ⟩

```
\cs_new:Npn \__ccool_prop_name:n #1{ __ccool_#1 }
```

(*End definition for* `\__ccool_prop_name:n`.)

__ccool_prop_new:n
#1 : ⟨ *tl var name* ⟩

```
\cs_new_protected:Nn \__ccool_prop_new:n
{
  \prop_new:c{ \__ccool_prop_name:n {#1} }
}
```

(*End definition for* `\__ccool_prop_new:n`.)

8 seq

__ccool_seq_from_prop:NNn
#1 : ⟨ seq_1 ⟩
#2 : ⟨ seq_2 ⟩ (keys)
#3 : ⟨ *prop* ⟩

```
\cs_new_protected:Nn \__ccool_seq_from_prop:NNn
{
  \cs_set_protected:Nn \__ccool_seq_from_prop:n
  {
    \seq_gput_right:No #1 { \prop_item:cn{#3}{##1} }
  }
  \seq_map_function:NN #2 \__ccool_seq_from_prop:n
}
```

(*End definition for* `\__ccool_seq_from_prop:NNn`.)

__ccool_erw_seq_use:Nn

```
%       \begin{arguments}
%       \item \meta{ seq }
%       \item \meta{ tokens }
%       \end{arguments}
\cs_new:Nn \__ccool_seq_use:Nn
{
  \exp_last_unbraced:NNf
  \seq_use:Nnnn #1
  \__ccool_aux_separ:n{#2}
}
```

(*End definition for* `\__ccool_erw_seq_use:Nn`.)

9 Front-end

```
\keys_define:nn { __ccool }
{
  Expans .multichoices:nn =
  { eo, ee, ex, xo, xe, xx }
  { \tl_gset_eq:NN \g__ccool_option_expans_tl \l_keys_choice_tl },
  Expans .default:n = { xo },
  Expans .initial:n = { xo },
  File .code:n = { \tl_gset:Nn  \g__ccool_log_file_tl{ \exp_not:n{ #1 } } },
  File .default:n = { ccool\pdfcreationdate },
  File .initial:n = { ccool\pdfcreationdate },
  Name .code:n={
    \__ccool_option_name:n{#1}
    \exp_last_unbraced:Nf
    \__ccool_make_ccool:nnnn
    {
      { \g__ccool_option_name_tl }
      { \g__ccool_option_inner_tl }
      { \g__ccool_option_separ_tl }
      { \g__ccool_option_outer_tl }
    }
  },
  Name .value_required:n = false,
  Name .default:n = { Math },
  Name .initial:n = { Math },
  Inner .code:n={
    \__ccool_option_inner:n{#1}
    \exp_last_unbraced:Nf
    \__ccool_make_ccool:nnnn
    {
      { \g__ccool_option_name_tl }
      { \g__ccool_option_inner_tl }
      { \g__ccool_option_separ_tl }
      { \g__ccool_option_outer_tl }
    }
  },
  Inner .value_required:n = false,
  Inner .default:n = {####1},
```

```
  Inner .initial:n = {####1},
  Outer .code:n={
    \__ccool_option_outer:n{#1}
    \exp_last_unbraced:Nf
    \__ccool_make_ccool:nnnn
    {
      { \g__ccool_option_name_tl }
      { \g__ccool_option_inner_tl }
      { \g__ccool_option_separ_tl }
      { \g__ccool_option_outer_tl }
    }
  },
  Outer .value_required:n = false,
  Outer .default:n = { \ensuremath{####1} },
  Outer .initial:n = { \ensuremath{####1} },
  Write .code:n = {
    \bool_if:nTF{#1}
    {\__ccool_log_open:}
    {\__ccool_log_close:}
  },
  Write .value_required:n = false,
  Write .default:n = \BooleanFalse,
  Write .initial:n = \BooleanFalse,
  Separ .code:n={
    \__ccool_option_separ:n{#1}
    \exp_last_unbraced:Nf
    \__ccool_make_ccool:nnnn
    {
      { \g__ccool_option_name_tl }
      { \g__ccool_option_inner_tl }
      { \g__ccool_option_separ_tl }
      { \g__ccool_option_outer_tl }
    }
  },
  Separ .value_required:n = false,
  Separ .default:n = { {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } },
  Separ .initial:n = { {\ }and{\ } } { ,{\ } } { ,{\ }and{\ } }
}
```

\CcoolClear `#1` : ⟨ *tl var name* ⟩

```
\NewDocumentCommand{ \CcoolClear }
{ D<>{\g__ccool_option_name_tl} }
{
  \__ccool_prop_clear_new_map:n{#1}
}
```

(*End definition for* `\CcoolClear`. *This function is documented on page* 5.)

\CcoolDebug

```
\NewDocumentCommand\CcoolDebug{m}
{
  \__ccool_prop_if_exist:nTF{#1}
  { \c_empty_tl }
  { \__ccool_prop_new:n{#1} }
```

```
  \__ccool_make_key:Nn \KeyA{KeyA}
  \gappto{\CcoolHook}
  {
    \__ccool_prop_if_exist:nTF{#1}
    { \c_empty_tl }
    { \__ccool_prop_new:n{#1} }
    \__ccool_make_key:Nn \KeyA{KeyA}
  }
}
```

(*End definition for* `\CcoolDebug`. *This function is documented on page* 5.)

`\CcoolOption`

```
\NewDocumentCommand{ \CcoolOption }
{ m }
{
  \keys_set:nn{ __ccool }{#1}
}
```

(*End definition for* `\CcoolOption`. *This function is documented on page* 5.)

`\CcoolRead`

```
\NewDocumentCommand{\CcoolRead}
{o}
{
  \IfValueTF{#1}
  {\__ccool_log_read:e{#1}}
  {\__ccool_log_read:}
}
```

(*End definition for* `\CcoolRead`. *This function is documented on page* 6.)

10 Misc

```
\ExplSyntaxOff
```