

# The letterswitharrows package

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This package does provides math-mode commands for setting left and right arrows over mathematical symbols, so that the arrows dynamically scale with the symbols. Here is a sample:

$$\vec{s} \leq \vec{t} \in \vec{U_r} \quad |\overrightarrow{AB}| = |\overleftarrow{AB}| \quad A \overleftrightarrow{\hspace{.1em}} B$$

Somehow embellishments don't work in the documentation!? While it is possible to set arrows over longer strings of symbols, the focus lies on single characters.

Only PDF output is supported. Output to PS is implemented, but rarely tested. For a wider range of formats there is pgf-based output.

## 1 Usage

The package provides the general-purpose `\arrowoverset` command, as well as some sets of predefined shorthand commands.

### 1.1 Presets

The presets are selected by passing them as options to the `presets` package option. For instance, to define the `abc` and the `vec-cev` sets of commands you would load the package like so:

```
\usepackage[presets={abc,vec-cev}]{letterswitharrows}
```

By default, the `abc`, `ABC` and `cAcBcC` presets are loaded.

`abc`      Passing `abc` to the `presets` option allows you to use the `\v<char>` and `\<char>v` commands for all the lower-case letters `a` through `z` except for `v`.

---

`\v<char>`  
`\<char>v`  
`\vleft`  
`\vright`

---

For the letter `v` the commands `\vleft` and `\vright` are provided.

$$\vec{a}, \vec{b}, \vec{c}, \vec{d}, \vec{m}, F_{\vec{t}}$$

```
\[ \va, \vb, \vc, \dv, \mv, F_{\tv} \]
```

`ABC`      Passing `ABC` to the `presets` option allows you to use the `\v<CHAR>` and `\<CHAR>v` commands for all the upper-case letters `A` through `Z`.

---

`\v<CHAR>`  
`\<CHAR>v`

---

$\overrightarrow{A}, \overrightarrow{B}, \overrightarrow{C}, \overrightarrow{D}, \overrightarrow{E}, F_{\overline{G}}$

`\[ \vA, \vB, \vC, \Dv, \Ev, F_{\Gv} \]`

`cAcBcC`

Passing `cAcBcC` to the `presets` option allows you to use the `\vc<CHAR>` and `\c<CHAR>v` commands for all the upper-case letters A through Z to set arrows over `\mathcal`-letters.

---

`\vc<CHAR>`  
`\c<CHAR>v`

---

$\overrightarrow{A}, \overrightarrow{B}, \overrightarrow{C}, \overrightarrow{D}, \overrightarrow{E}, F_{\overline{G}}$

`\[ \vcA, \vcB, \vcC, \cDv, \cEv, F_{\cGv} \]`

`vec-cev`

Passing `vec-cev` to the `presets` option (re)defines the `\vec` and `\cev` commands.

---

`\vec`  
`\cev`

---

Unlike the other commands these do not automatically consume subsequent subscripts or ' tokens.

$\overrightarrow{x} := \overleftarrow{AB} \quad \langle \overrightarrow{w}, \overrightarrow{v} \rangle = 42$

`\[ \vec{\mathbf{x}} := \cev{AB} \quad \lqqquad \langle \vw, \vright \rangle = 42 \]`

## 1.2 The `\arrowoverset` command

---

`\arrowoverset`  
`\arrowoverset*`

---

`\arrowoverset` [*xoffset*] [*xscale*] [*yoffset*] {*math*}

`\arrowoverset*` [*xoffset*] [*xscale*] [*yoffset*] {*math*}

This command sets a right (or left if `\arrowoverset*` is used) arrow over *math*. The base length of the arrow is the width of the *math* multiplied by *xscale*, which must be specified as a fraction *num*/*denom*. The arrow is offset by *xoffset* to the right, which must be a math skip expression, and by *yoffset* to the top, which must be a skip expression.

This command consumes subsequent subscripts or up to two primes '. The former does not affect the length of the arrow.

## 1.3 Other package options

**pgf** If you specify the `pgf` option, every arrow is drawn as a `pgfpicture`. This requires the `pgf` package, and slow in its current implementation.

**T<sub>E</sub>Xhackers note:** You can set up custom arrow drawing code by redefining `\_jmt\_lwa\_arrow\_draw:nnn`. The command is expected to draw an arrow with its head at the current position. Its length should be #1 and it should be drawn at a font size of #2pt. If #3 is - if the arrow should point rightwards and empty otherwise.

**tweaks**

Specifying the `tweaks` option applies per-letter scaling adjustments to some of the single-letter shorthands. This is enabled by default. These are specific to Latin Modern Math and subject to be changed on a whim. If you wish a more stable behaviour specify `tweaks=false`

## 2 Implementation

```

1 <@@=jmt_lwa>
2 \msg_new:nnn {letterswitharrows} {pdf-only} {Only~pdf-output~is~supported.}
3 \AtBeginDocument{
4   \sys_if_output_pdf:F {
5     \msg_warning:nn {letterswitharrows} {pdf-only}
6   }
7 }

```

The drawing code.

```

\__jmt_lwa_arrow_draw_special:nnn
\__jmt_lwa_arrow_draw_pgfi:nnn
\__jmt_lwa_arrow_left:nn
\__jmt_lwa_arrow_right:nn
8 \cs_new:Nn \__jmt_lwa_arrow_draw_special:nnn % length, font size, sign
9 {
10   \sys_if_output_pdf:TF {
11     \tex_special:D {pdf:~
12       q~
13       1~J~1~j~
14       1~0~0~\dim_to_decimal:n{#3#2pt/10}~0~0~cm~
15       .3~w~
16       q~
17       \dim_to_decimal:n{#3#2pt/10}~0~0~1~0~0~cm~
18       1~0~0~1~1~0~cm~
19       0~1~m~
20       .25~0~1~0~1~0~cm~
21       1~0~.25~0~0~1~cm~
22       S~
23       Q~
24       0~0~m~
25       -1~0~0~1~0~0~cm~
26       \dim_to_decimal:n{#3#1}~0~1~S~
27       Q
28     }
29   } {
30     \tex_special:D {"~
31       1~setlinecap~1~setlinejoin~
32       1~0~0~\dim_to_decimal:n{#3#2pt/10}~0~0~6~array~astore~concat~
33       .3~setlinewidth~
34       gsave~
35       \dim_to_decimal:n{#3#2pt/10}~0~0~1~0~0~6~array~astore~concat~
36       1~0~0~1~1~0~6~array~astore~concat~
37       0~1~moveto~
38       .25~0~1~0~1~0~curveto~
39       1~0~.25~0~0~1~curveto~
40       stroke~
41       grestore~
42       0~0~moveto~
43       -1~0~0~1~0~0~6~array~astore~concat~
44       \dim_to_decimal:n{#3#1}~0~1~lineto~stroke
45     }
46   }
47 }
48
49 % TODO

```

```

50 % \tl_new:N \g__jmt_lwa_pgf_arrow_style_tl
51 % \tl_set:Nn \g__jmt_lwa_pgf_arrow_style_tl
52 %   {Computer~Modern~Rightarrow[width=#2pt*2/10,length=#2pt/10,sharp]}
53
54 \cs_new:Nn \__jmt_lwa_arrow_draw_pgfn {
55   \begin{pgfpicture}
56     \pgfsetlinewidth{#2pt/30}
57     \pgfsetarrowsstart
58     {Computer~Modern~Rightarrow[width=#2pt*2/10,length=#2pt/10,sharp]}
59     % \pgfsetarrowsstart{\tl_use:N \g__jmt_lwa_pgf_arrow_style_tl}
60     \pgfpathmoveto{\pgfpointorigin}
61     \pgfpathlineto{\pgfpoint{-#3#1}{0cm}}
62     \pgfusepath{stroke}
63     \pgfresetboundingbox
64   \end{pgfpicture}
65 }
66
67 \cs_new_eq:NN \__jmt_lwa_arrow_draw:nnn \use_none:nnn
68
69 \cs_new:Nn \__jmt_lwa_arrow_right:nn {
70   \skip_horizontal:n {#1}
71   % \rule[\dimexpr -#2pt/6\relax]{#1}{\dimexpr #2pt/3\relax}
72   \__jmt_lwa_arrow_draw:nnn {#1} {#2} {}
73 }
74
75 \cs_new:Nn \__jmt_lwa_arrow_left:nn {
76   \__jmt_lwa_arrow_draw:nnn {#1} {#2} {-}
77   \skip_horizontal:n {#1}
78   % \rule[\dimexpr -#2pt/6\relax]{#1}{\dimexpr #2pt/3\relax}
79 }

```

(End definition for \\_\_jmt\_lwa\_arrow\_draw\_special:nnn and others.)

The core functions.

\\_\_jmt\_lwa\_arrow\_overset\_style:Nnncnnn

\\_\_jmt\_lwa\_arrow\_overset:nnnnn

```

80 \cs_new:Npn \__jmt_lwa_arrow_overset_style:Nnncnnn #1#2#3#4#5#6#7 {
81   \hbox_set:Nn \l_tmpa_box {$\m@th#1#3$}
82   \dim_set:Nn \l_tmpa_dim {#2 pt/10}
83   \vbox:n {
84     \tex_lineskiplimit:D = \maxdimen
85     \tex_baselineskip:D = 0pt
86     \tex_lineskip:D = \dim_eval:n {\l_tmpa_dim * 3/2 + #7}
87     \tex_halign:D { ## \tex_cr:D
88       \skip_horizontal:n {\l_tmpa_dim / 2}
89       $
90       \m@th
91       #1
92       \tex_mskip:D \muskip_eval:n {#5}
93       \use:c {#4} {\dim_eval:n{\box_wd:N \l_tmpa_box * #6}} {#2}
94       $
95       \tex_cr:D
96       \box_use_drop:N \l_tmpa_box
97       \tex_cr:D
98     }
99   }

```

```

100 }
101
102 \cs_new:Nn \__jmt_lwa_arrow_overset:nnnnn { % content, direction, xoffset, scale, yoffset
103   \mathchoice {
104     \__jmt_lwa_arrow_overset_style:Nnnccnnn
105     \displaystyle {\tf@size} {#1} {\__jmt_lwa_arrow_#2:nn} {#3} {#4} {#5}
106   } {
107     \__jmt_lwa_arrow_overset_style:Nnnccnnn
108     \textstyle {\tf@size} {#1} {\__jmt_lwa_arrow_#2:nn} {#3} {#4} {#5}
109   } {
110     \__jmt_lwa_arrow_overset_style:Nnnccnnn
111     \scriptstyle {\sf@size} {#1} {\__jmt_lwa_arrow_#2:nn} {#3} {#4} {#5}
112   } {
113     \__jmt_lwa_arrow_overset_style:Nnnccnnn
114     \scriptscriptstyle {\ssf@size} {#1} {\__jmt_lwa_arrow_#2:nn} {#3} {#4} {#5}
115   }
116 }

```

(End definition for \\_\_jmt\_lwa\_arrow\_overset\_style:Nnnccnnn and \\_\_jmt\_lwa\_arrow\_overset:nnnnn.)

\\_\_jmt\_lwa\_arrow\_overset:w

\arrowoverset

```

117 \cs_new_protected:Npn \__jmt_lwa_arrow_overset:w {
118   \c_group_begin_token
119   \__jmt_lwa_arrow_overset_aux:w
120 }
121
122 % This exp_args is necessary because _ generates the wrong token in expl3 syntax
123 \exp_args:NNx \NewDocumentCommand \__jmt_lwa_arrow_overset_aux:w
124   {s O{0mu} O{1} O{0ex} m t' e{\char_generate:nn {95}{8}} t'} {
125   \__jmt_lwa_arrow_overset:nnnnn
126   {
127     #5
128     \c_math_superscript_token {
129       \scriptscriptstyle\IfBooleanT{#6}{\prime}\IfBooleanT{#8}{\prime}
130     } % TODO: Better positioning etc?
131     \exp_args:Nf\IfValueT{\use:n#7} {
132       \c_math_subscript_token {
133         \mathrlap{#7}
134       }
135     }
136   }
137   {\IfBooleanTF{#1}{left}{right}}
138   {#2} {#3} {#4}
139
140   \exp_args:Nf\IfValueTF{\use:n#7}{
141     % TODO: Better way to do this? This is all kinds of wrong.
142     \hphantom{\!\c_math_subscript_token{#7}}
143   } {}
144   \c_group_end_token
145 }
146 \cs_set_eq:NN \arrowoverset \__jmt_lwa_arrow_overset:w

```

Replacements for hyperref bookmarks.

```

147 \AtBeginDocument{
148   \@ifpackageloaded{hyperref}{

```

```

149 \pdfstringdefDisableCommands{
150   % Why does this only work with Expandable?
151   \DeclareExpandableDocumentCommand \__jmt_lwa_arrow_overset:w {s o o o m} {
152     \ifpdfstringunicode
153       {#5 \IfBooleanTF{#1}}{\unichar{"20D6}}{\unichar{"20D7}}}
154     {#5}
155   }
156 }
157 {}
158 }

```

(End definition for `\__jmt_lwa_arrow_overset:w` and `\arrowoverset`. This function is documented on page 2.)

Package option handling.

```

\g__jmt_lwa_tweak_shortcuts_bool
\g__jmt_lwa_selected_presets_prop
\__jmt_lwa_arrow_draw:nnn
159 \bool_new:N \g__jmt_lwa_tweak_shortcuts_bool
160 \prop_new:N \g__jmt_lwa_selected_presets_prop
161 \keys_define:nn {letterswitharrows} {
162   mode .choice:,
163   mode / special .code:n = {
164     \cs_set_eq:NN \__jmt_lwa_arrow_draw:nnn \__jmt_lwa_arrow_draw_special:nnn
165   },
166   mode / pgf .code:n = {
167     \RequirePackage{pgf}
168     \ExplSyntaxOff\usepgflibrary{arrows.meta}\ExplSyntaxOn
169     \cs_set_eq:NN \__jmt_lwa_arrow_draw:nnn \__jmt_lwa_arrow_draw_pgf:nnn
170   },
171   mode .initial:n = {special},
172   pgf .meta:n = {mode = pgf},
173   presets .multichoices:nn = {abc, ABC, cAcBcC, vec-cev} {
174     \int_compare:nNnTF \l_keys_choice_int = 1 {
175       \prop_gc_clear:N \g__jmt_lwa_selected_presets_prop
176     } {}
177     \prop_gput:NvN \g__jmt_lwa_selected_presets_prop \l_keys_choice_tl {}
178   },
179   presets .initial:n = {abc, ABC, cAcBcC},
180   tweaks .bool_set:N = \g__jmt_lwa_tweak_shortcuts_bool,
181   tweaks .initial:n = {true},
182 }
183 \ProcessKeysPackageOptions{letterswitharrows}

```

(End definition for `\g__jmt_lwa_tweak_shortcuts_bool`, `\g__jmt_lwa_selected_presets_prop`, and `\__jmt_lwa_arrow_draw:nnn`.)

```

\<char>
\<char>v
\left
\right
184 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {abc} {
185   \int_step_inline:nnn {1} {26} {
186     \int_compare:nNnTF {#1} = {22} {
187       \cs_new:cpx {vright} {
188         \exp_not:N\__jmt_lwa_arrow_overset:w{v}
189       }
190       \cs_new:cpx {vleft} {
191         \exp_not:N\__jmt_lwa_arrow_overset:w*{v}
192       }

```

```

193 } {
194   \cs_new:cpx {v\int_to_alph:n{#1}} {
195     \exp_not:N\__jmt_lwa_arrow_overset:w{\int_to_alph:n{#1}}
196   }
197   \cs_new:cpx {\int_to_alph:n{#1}v} {
198     \exp_not:N\__jmt_lwa_arrow_overset:w*{\int_to_alph:n{#1}}
199   }
200 }
201 }
202 } {}

```

(End definition for `\v<char>` and others. These functions are documented on page 1.)

`\v<CHAR>`

`\<CHAR>v`

```

203 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {ABC} {
204   \int_step_inline:nnn {1} {26} {
205     \cs_new:cpx {v\int_to_Alph:n{#1}} {
206       \exp_not:N\__jmt_lwa_arrow_overset:w{\int_to_Alph:n{#1}}
207     }
208     \cs_new:cpx {\int_to_Alph:n{#1}v} {
209       \exp_not:N\__jmt_lwa_arrow_overset:w*{\int_to_Alph:n{#1}}
210     }
211   }
212 } {}

```

(End definition for `\v<CHAR>` and `\<CHAR>v`. These functions are documented on page 2.)

`\vc<CHAR>`

`\c<CHAR>v`

```

213 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {cAcBcC} {
214   \int_step_inline:nnn {1} {26} {
215     \cs_new:cpx {vc\int_to_Alph:n{#1}} {
216       \exp_not:N\__jmt_lwa_arrow_overset:w{\exp_not:N\mathcal{\int_to_Alph:n{#1}}}
217     }
218     \cs_new:cpx {c\int_to_Alph:n{#1}v} {
219       \exp_not:N\__jmt_lwa_arrow_overset:w*{\exp_not:N\mathcal{\int_to_Alph:n{#1}}}
220     }
221   }
222 } {}

```

(End definition for `\vc<CHAR>` and `\c<CHAR>v`. These functions are documented on page 2.)

`\vec`

`\cev`

```

223 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {vec-cev} {
224   \RenewDocumentCommand \vec {m} {
225     \__jmt_lwa_arrow_overset:w {#1} \scan_stop:
226   }
227   \DeclareDocumentCommand \cev {m} {
228     \__jmt_lwa_arrow_overset:w* {#1} \scan_stop:
229   }
230 } {}

```

(End definition for `\vec` and `\cev`. These functions are documented on page 2.)

Some personal-preference tweaks.

```

231 \bool_if:NTF \g__jmt_lwa_tweak_shortcuts_bool {
232   \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {ABC} {

```

```

233     \cs_set:cpn {vS} {
234         \__jmt_lwa_arrow_overset:w[2mu][8/10]{S}
235     }
236 } {}
237 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {abc} {
238     \cs_new:cpn {vell} {
239         \__jmt_lwa_arrow_overset:w{\ell}
240     }
241     \cs_new:cpn {ellv} {
242         \__jmt_lwa_arrow_overset:w{\ell}
243     }
244 } {}
245 } {}

```