

# The lua-unicode-math package\*

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<https://github.com/zauguin/lua-unicode-math>

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Modern fonts are usually provided in OpenType format and are designed for Unicode based input. For mathematical fonts this usually means the use of fonts with an OpenType MATH table: Fonts containing special metadata needed to make them usable in a mathematical context.

In Lua<sub>TeX</sub> such fonts have traditionally been loaded with the `unicode-math` package. While this works, is very flexible and allows to use the same document in Xe<sub>TeX</sub> and Lua<sub>TeX</sub> it has performance issues and it sometimes has unexpected interactions with the use of math versions. The `lua-unicode-math` is a specific Lua<sub>La</sub>TeX specific alternative which aims for higher performance and better integration with native Lua<sub>TeX</sub> features.

## 1 Usage instructions

### 1.1 Font packages

For most Opentype the recommended way to load them with `lua-unicode-math` is to use a dedicated package. Currently the following packages are shipped with `lua-unicode-math`:

Font	Package
Latin Modern Math	<code>lum-lmodern</code>
New Computer Modern Math	<code>lum-newcomputermodern</code>
STIX2	<code>lum-stix2</code>
XITS	<code>lum-xits</code>
TeX Gyre Pagella Math	<code>lum-pagella</code>
TeX Gyre DejaVu Math	<code>lum-dejavu</code>
TeX Gyre Bonum Math	<code>lum-bonum</code>
TeX Gyre Schola Math	<code>lum-schola</code>
TeX Gyre Termes Math	<code>lum-termes</code>
Fira Math	<code>lum-fira</code>
GFS Neohellenic Math	<code>lum-gfsneohellenic</code>
Erewhon Math	<code>lum-erewhon</code>
XCharter Math	<code>lum-xcharter</code>
Concrete Math	<code>lum-concrete</code>

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\*This document corresponds to `lua-unicode-math` v0.3, dated 2026-01-01.

## 1.2 Loading fonts by name

If you want to use a custom font, you can load `fontspec` and `lua-unicode-math` using

```
\usepackage{fontspec, lua-unicode-math}
```

This will load Latin Modern Math by default. Another math font can be loaded using `\setmathfont` using the same options as `fontspec`'s `\newfontfamily`. For example, you can use to to configure the current math font using

```
\setmathfont[AutoFakeBold=1]{Latin Modern Math}
```

## 1.3 Writing maths

There are two ways of entering math: You can directly input Unicode math symbols or use regular L<sup>A</sup>T<sub>E</sub>X commands for symbols. All Unicode symbols are supported with the same commands as in `unicode-math`. For a full list see `texdoc unimath-symbols`.

## 2 Implementation

```
1 \ProvidesExplPackage
2   {lua-unicode-math}
3   {2026-01-01}
4   {0.3}
5   {Opentype Math support for LuaLaTeX}
6
7 <@=l_uni_math>
8 \int_new:N \g__l_uni_math_font_count_int
9 \tl_new:N \l__l_uni_math_main_family_tl
10 \tl_new:N \l__l_uni_math_script_family_tl
11 \tl_new:N \l__l_uni_math_scriptscript_family_tl
12
13 \cs_generate_variant:Nn \tl_if_eq:nnT {o}
14
15 \msg_new:nnn { l_uni_math } { unicode-math-suppressed } {
16   You~tried~to~load~both~lua-unicode-math~and~unicode-math~
17   in~the~same~document.~This~is~not~supported,~unicode-math~
18   will~be~suppressed.~There~is~a~good~chance~that~this~will~
19   break~your~document.~Change~your~document~to~only~use~lua-unicode-math~
20   so~solve~this.
21 }
22 \msg_new:nnn { l_uni_math } { unicode-math-loaded } {
23   You~tried~to~load~lua-unicode-math~while~unicode-math~
24   was~already~loaded.~This~does~not~work.~Please~avoid~loading~
25   unicode-math.~If~that~is~not~possible~and~you~are~feeling~adventurous~
26   you~can~try~loading~the~lua-unicode-math~package~at~the~beginning~
27   of~your~document~instead~to~suppress~unicode-math.
28 }
29 \disable@package@load{unicode-math} {
30   \msg_warning:nn { l_uni_math } {unicode-math-incompatible }
31 }
32 \IfPackageLoadedTF {unicode-math} {
33   \msg_critical:nn { l_uni_math } {unicode-math-loaded }
34 } {}
```

```

35
36
37 \cs_if_exist:NF \DeclareMathScriptfontMapping {
38   \cs_new:Npn \DeclareMathScriptfontMapping #1 #2 #3 #4 #5 #6 {
39     \cs_set:cpx { scriptfont__l_uni_math #1 / #2 } { #3 / #4 }
40     \cs_set:cpx { scriptscriptfont__l_uni_math #1 / #2 } { #5 / #6 }
41   }
42   \cs_set:Npn \__l_uni_math_family_variant:nw #1 #2/#3/ {
43     \ifcsname #1__l_uni_math#2/#3 \endcsname
44       \lastnamedcs
45     \else
46       #2/#3
47     \fi
48   /
49 }
50
51 % Hook into the kernel to allow different families in scriptfonts
52 \cs_set:Npn \getanddefine@fonts #1 #2 {
53   \xdef\font@name{\csname \string#2/\tf@size\endcsname}
54   \pickup@font \let\textfont@name\font@name
55   \xdef\font@name{\csname \exp_last_unbraced:Nno \__l_uni_math_family_variant:nw {scriptfont
56   \pickup@font \let\scriptfont@name\font@name
57   \xdef\font@name{\csname \exp_last_unbraced:Nno \__l_uni_math_family_variant:nw {scriptscr
58   \pickup@font
59   \edef\math@fonts{\math@fonts
60     \textfont#1\textfont@name
61     \scriptfont#1\scriptfont@name
62     \scriptscriptfont#1\font@name}
63 }
64 }
65
66 \hook_gput_code:nnn { package/fontspect/after } { . } {
67   \bool_gset_false:N \g__fontspec_math_bool
68
69   \NewDocumentCommand \setmathfont { O{} m O{} } { {
70     \int_incr:N \g__l_uni_math_font_count_int
71     \exp_args:Nc \newfontfamily
72       { \g__l_uni_math_font_ \int_use:N \g__l_uni_math_font_count_int _text_font }
73       { #2 }
74       [ #1, #3, Script = Math, Renderer = Base ]
75     \tl_set_eq:NN \l__l_uni_math_main_family_tl \l_fontspec_family_tl
76
77     \exp_args:Nc \newfontfamily
78       { \g__l_uni_math_font_ \int_use:N \g__l_uni_math_font_count_int _script_font }
79       { #2 }
80       [ #1, #3, Script = Math, Renderer = Base, Style = MathScript ]
81     \tl_set_eq:NN \l__l_uni_math_script_family_tl \l_fontspec_family_tl
82
83     \exp_args:Nc \newfontfamily
84       { \g__l_uni_math_font_ \int_use:N \g__l_uni_math_font_count_int _scriptscript_font }
85       { #2 }
86       [ #1, #3, Script = Math, Renderer = Base, Style = MathScriptScript ]
87     \tl_set_eq:NN \l__l_uni_math_scriptscript_family_tl \l_fontspec_family_tl
88

```

```

89   \DeclareMathScriptfontMapping {TU} {\l__l_uni_math_main_family_tl} {TU} {\l__l_uni_math_s
90
91   \exp_args:NnnV \DeclareSymbolFont {lummain} {TU} \l__l_uni_math_main_family_tl {m} {n}
92   \exp_args:NnnnV \SetSymbolFont {lummain} {bold} {TU} \l__l_uni_math_main_family_tl {b} {r
93 }
94
95 \cs_set:Nn \__fontspec_setmainfont_hook:nn
96 {
97   \tl_if_eq:onT {\g__fontspec_mathrm_tl} {\rmdefault}
98   {
99     \fontspec_gset_family:Nnn \g__fontspec_mathrm_tl {Renderer=Basic,#1} {#2}
100    \__fontspec_setmathrm_hook:nn {#1} {#2}
101  }
102 }
103 \cs_set:Nn \__fontspec_setsansfont_hook:nn
104 {
105   \tl_if_eq:onT {\g__fontspec_mathsf_tl} {\sfdefault}
106   {
107     \fontspec_gset_family:Nnn \g__fontspec_mathsf_tl {Renderer=Basic,#1} {#2}
108     \__fontspec_setmathsf_hook:nn {#1} {#2}
109   }
110 }
111 \cs_set:Nn \__fontspec_setmonofont_hook:nn
112 {
113   \tl_if_eq:onT {\g__fontspec_mathtt_tl} {\ttdefault}
114   {
115     \fontspec_gset_family:Nnn \g__fontspec_mathtt_tl {Renderer=Basic,#1} {#2}
116     \__fontspec_setmathtt_hook:nn {#1} {#2}
117   }
118 }
119 \cs_set:Nn \__fontspec_setmathrm_hook:nn
120 {
121   \SetMathAlphabet \mathrm { normal } \g_fontspec_encoding_tl \g__fontspec_mathrm_tl { \m
122   \SetMathAlphabet \mathit { normal } \g_fontspec_encoding_tl \g__fontspec_mathrm_tl { \m
123   \SetMathAlphabet \mathbf { normal } \g_fontspec_encoding_tl \g__fontspec_mathrm_tl { \b
124 }
125 \cs_set:Nn \__fontspec_setboldmathrm_hook:nn
126 {
127   \SetMathAlphabet \mathrm { bold } \g_fontspec_encoding_tl \g__fontspec_bfmathrm_tl { \m
128   \SetMathAlphabet \mathit { bold } \g_fontspec_encoding_tl \g__fontspec_bfmathrm_tl { \m
129   \SetMathAlphabet \mathbf { bold } \g_fontspec_encoding_tl \g__fontspec_bfmathrm_tl { \b
130 }
131 \cs_set:Nn \__fontspec_setmathsf_hook:nn
132 {
133   \SetMathAlphabet \mathsf { normal } \g_fontspec_encoding_tl \g__fontspec_mathsf_tl { \m
134   \SetMathAlphabet \mathsf { bold } \g_fontspec_encoding_tl \g__fontspec_mathsf_tl { \bfs
135 }
136 \cs_set:Nn \__fontspec_setmathtt_hook:nn
137 {
138   \SetMathAlphabet \mathtt { normal } \g_fontspec_encoding_tl \g__fontspec_mathtt_tl { \m
139   \SetMathAlphabet \mathtt { bold } \g_fontspec_encoding_tl \g__fontspec_mathtt_tl { \bfs
140 }
141 %
142 \__fontspec_setmathrm_hook:nn {} {}

```

```

143 \__fontspec_setmathsf_hook:nn {} {}
144 \__fontspec_setmathtt_hook:nn {} {}
145 }
146
147 \cs_set_protected:Npn \operator@font {
148   \@fontswitch { \font@warning{Math-mode-required-for-\string\operator@font.} } { \mathtextrm
149 }
150
151 \DeclareSymbolFont {lummain} {TU} {lmm} {m} {n}
152 \SetSymbolFont {lummain} {bold} {TU} {lmm} {b} {n}
153
154 \newattribute \mathfamattr
155
156 \lua_load_module:n { lua-unicode-math }
157
158 % up, it, bfup, bfit, sfup, sfit, bfsfup, bfsfit, bfsf, % 9
159 % tt, bb, bbit, scr, bfscr, cal, bfcalf, bfrak, bffrak, % 9
160 % normal, literal, sf, bf, % 4
161
162 % bf, % 9
163 % bbit, % TODO: sigh. I really don't want this one. The only affected characters are .
164 % scr, bfscr, % 9 % TODO: Think about these
165
166 \prop_set_from_keyval:Nn \l_tmpa_prop {
167   up = 0, bfup = 1, it = 2, bfit = 3,
168   sfup = 4, bfsfup = 5, sfit = 6, bfsfit = 7,
169   cal = 8, bfcalf = 9,
170   frak = 12, bffrak = 13,
171   tt = 16,
172   bb = 20,
173   bf = 1024,
174   normal = -"7FFFFFFF,
175   literal = -1,
176 }
177 \cs_set_eq:NN \mathup \mathrm
178 \prop_map_inline:Nn \l_tmpa_prop {
179   \cs_new_protected:cpn { sym #1 } ##1 {
180     {
181       \mathfamattr = #2 \scan_stop:
182       ##1
183     }
184   }
185   \cs_if_exist:cTF { math #1 } {
186     \cs_set_eq:cc { mathtext #1 } { math #1 }
187   } {
188     \cs_set_eq:cc { math #1 } { sym #1 }
189   }
190 }
191 \cs_set_eq:NN \mathtextrm \mathrm
192 \cs_set_eq:NN \symrm \symup

```

In unicode-math there is a package option to use italic or upright letters for `\symsf` and `\symbfsf`. Depending on the setting these become aliases for `\symsfup` and `\symbfsfup` or `\symsffit` and `\symbfsfit`. Since we do not want package option, we always use

upright letters and you can redefine `\symsf` and `\symbfsf` if you want to change it.

```

193 \cs_set_eq:NN \mathtextsf \mathsf
194 \cs_set_eq:NN \symsf \symsfup
195 \cs_set_eq:NN \symbfsf \symbfsfup
196
197 \clist_map_inline:nn { cal, calbf, frak, frakbf, bb } {
198   \cs_set_eq:cc { math #1 } { sym #1 }
199 }
200
201 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathord :nn } #1 #2 {
202   \cs_set:Npx #1 {
203     \char_generate:nn {#2} {12}
204   }
205 }
206 \tl_map_inline:nn {\mathbin \mathclose \mathpunct \mathrel} {
207   \cs_new_eq:cc
208     { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N #1 :nn }
209     { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathord :nn }
210 }
211
212 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathop :nn } #1 #2 {
213   \exp_args:Nc \Umathchardef { \cs_to_str:N #1 op } 1~\symlummain #2~
214   \cs_set_eq:cN { \cs_to_str:N #1 oplimits } \scan_stop:
215   \cs_set:Npx #1 {
216     \char_generate:nn {#2} {12}
217   }
218   \mathcode #2 = "8000~
219   \cs_set:cpx { \char_generate:nn {"FFFF} {12} \char_generate:nn {#2} {12} } {
220     \use:c { \cs_to_str:N #1 op }
221     \use:c { \cs_to_str:N #1 oplimits }
222   }
223 }
224
225 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathopen :nn } #1 #2 {
226   \token_if_eq_meaning:NNTF #1 \sqrt {
227     \cs_set:Npx \sqrtsign {
228       \Uradical \symlummain #2~
229     }
230     \cs_set:Npx \root ##1 \of {
231       \Uroot \symlummain #2~ { ##1 }
232     }
233   }{
234     \cs_set:Npx #1 {
235       \char_generate:nn {#2} {12}
236     }
237   }
238 }
239
240 \group_begin:
241 \cs_set:Npn \l_tmp_cs:n #1 {
242   \group_end:
243
244   \cs_new_protected:Npn \__l_uni_math__check_mup_helper:w ##1 #1 ##2 \q_mark ##3 ##4 \q_stop
245     ##3 {##2}

```

```

246 }
247
248 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathalpha :nn } ##1 ##2 {
249   \cs_set:Npx ##1 {
250     \char_generate:nn {##2} {12}
251   }
252   \exp_after:wN \__l_uni_math__check_mup_helper:w \token_to_str:N ##1 \q_mark \cs_set_eq:cn
253 }
254 }
255
256 \exp_args:No \l_tmp_cs:n {
257   \token_to_str:N \mup
258 }
259
260 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathfence :nn } #1 #2 {
261   \cs_set:Npx #1 {
262     \char_generate:nn {#2} {12}
263   }
264   \cs_set:cpx {l \cs_to_str:N #1} {
265     \Udelimiter 4 ~ \symlummain #2 ~
266   }
267   \cs_set:cpx {r \cs_to_str:N #1} {
268     \Udelimiter 5 ~ \symlummain #2 ~
269   }
270 }
271
272 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathaccent :nn } #1 #2 {
273   \cs_set_protected:Npx #1 {
274     \Umathaccent fixed 0 ~ \symlummain #2 ~
275   }
276 }
277
278 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathbotaccent :nn } #1 #2 {
279   \cs_set:Npx #1 {
280     \exp_not:N \PackageError{lua-unicode-math}{Unsupported-type~\token_to_str:N \mathbotaccen
281   }
282 }
283
284 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathaccentwide :nn } #1 #2 {
285   \cs_set:Npx #1 {
286     \Umathaccent 0 ~ \symlummain #2 ~
287   }
288 }
289
290 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathbotaccentwide :nn } #1 #2 {
291   \cs_set:Npx #1 {
292     \Umathaccent bottom 0 ~ \symlummain #2 ~
293   }
294 }
295
296 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathaccentoverlay :nn } #1 #2 {
297   \cs_set:Npx #1 {
298     \Umathaccent overlay 0 ~ \symlummain #2 ~
299   }

```

```

300 % \cs_set:Npx #1 {
301 %   \exp_not:N \PackageError{lua-unicode-math}{Unsupported-type-\token_to_str:N \mathaccent
302 % }
303 }
304
305 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathover :nn } #1 #2 {
306   \cs_set:Npx #1 {
307     \exp_not:N \PackageError{lua-unicode-math}{Unsupported-type-\token_to_str:N \mathover}{}
308   }
309 }
310
311 \cs_new:cpn { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N \mathunder :nn } #1 #2 {
312   \cs_set:Npx #1 {
313     \exp_not:N \PackageError{lua-unicode-math}{Unsupported-type-\token_to_str:N \mathunder}{}
314   }
315 }
316
317 \cs_generate_variant:Nn \exp_args:Ne {c}
318 \cs_new:Npn \UnicodeMathSymbol #1 #2 #3 #4 {
319   \use:c { __l_uni_math_UnicodeMathSymbol_ \token_to_str:N #3 :nn }
320   {#2} {#1}
321 }
322 \input {unicode-math-table}
323 \cs_undefine:N \UnicodeMathSymbol
324
325 \cs_set_protected:Npn \triangle { \mathord { \bigtriangleup } }
326 \cs_set_protected:Npn \mathellipsis { \mathinner { \unicodeellipsis } }
327 \cs_set_protected:Npn \cdots { \mathinner { \unicodcdots } }
328
329 \clist_map_inline:nn {
330   \to \rightarrow,
331   \le \leq,
332   \ge \geq,
333   \neq \neq,
334   \bigcirc \mdlgwhtcircle,
335   \circ \vysmwhtcircle,
336   \bullet \smbllkcircle,
337   \mathyen \yen,
338   \mathsterling \sterling,
339   \diamond \smwhtdiamond,
340   \emptyset \varnothing,
341   \hbar \hslash,
342   \land \wedge,
343   \lor \vee,
344   \owns \ni,
345   \gets \leftarrow,
346   \mathring \ocirc,
347   \lnot \neg,
348   \longdivision \longdivisionsign,
349   \backepsilon \upbackepsilon,
350   \eth \matheth,
351   \dotsb@ \cdots,
352   \@cdots \cdots,
353 } {

```



```

354 \cs_set_eq:NN #1
355 }
356
357 \cs_set_eq:NN \intoplimits \nolimits
358
359 \cs_set_protected:cpx { \char_generate:nn {"FFFF"} {12} ' ' } {
360 \prime_helper:w "2032~
361 }
362
363 \cs_set_protected:Npn \uproot #1 {
364 \__l_uni_math_uproot:w #1 \scan_stop:
365 }
366
367 \cs_set_protected:Npn \leftroot #1 {
368 \__l_uni_math_leftroot:w #1 \scan_stop:
369 }

```

Some fixes for amsmath: Since amsmath is defining `\leftroot`, `\uproot` and `\root` with non Unicode definitions, we need to hide our definitions and restore them afterwards. We define `\varGamma` to stop amsmath from trying to define greek letter variants.

```

370 \tl_const:Nn \c__l_uni_math_amsmath_cmds_tl {
371 \uproot
372 \leftroot
373 \iint
374 \iiint
375 \iiiiint
376 \ddddot
377 \ddddot
378 \overleftarrow
379 \underrightarrow
380 \underleftarrow
381 \underleftrightharrow
382 \hat
383 \check
384 \tilde
385 \acute
386 \grave
387 \dot
388 \ddot
389 \breve
390 \bar
391 \vec
392 \mathring
393 }
394 \tl_const:Nn \c__l_uni_math_amsmath_cmds_defined_tl {
395 \root
396 \int
397 \oint
398 \overrightarrow
399 \overleftarrow
400 }
401 \hook_gput_code:nnn { package/amsmath/before } { . } {
402 \tl_map_inline:Nn \c__l_uni_math_amsmath_cmds_tl {
403 \cs_new_eq:cN { __l_uni_math_saved_ \cs_to_str:N #1 } #1
404 \cs_undefine:N #1

```

```

405 }
406 \tl_map_inline:Nn \c__l_uni_math_amsmath_cmds_defined_tl {
407   \cs_new_eq:cN { __l_uni_math_saved_ \cs_to_str:N #1 } #1
408 }
409 \cs_set:Npn \varGamma { \temporary_definition_do_not_use }
410 }
411 \hook_gput_code:nnn { package/amsmath/after } {.} {
412   \tl_map_inline:Nn \c__l_uni_math_amsmath_cmds_tl {
413     \cs_set_eq:Nc #1 { __l_uni_math_saved_ \cs_to_str:N #1 }
414     \cs_undefine:c { __l_uni_math_saved_ \cs_to_str:N #1 }
415   }
416   \tl_map_inline:Nn \c__l_uni_math_amsmath_cmds_defined_tl {
417     \cs_set_eq:Nc #1 { __l_uni_math_saved_ \cs_to_str:N #1 }
418     \cs_undefine:c { __l_uni_math_saved_ \cs_to_str:N #1 }
419   }
420   \cs_undefine:N \varGamma
421 }

```