

Kp-fonts: OpenType version

Daniel FLIPO

28th September, 2021

This bundle provides OpenType versions of Type1 Kp-fonts designed by Christophe Caignaert. See `Kpfonts-Doc-English.pdf` for the full documentation of the original Type1 fonts.

It is usable only with LuaTeX or XeTeX engines; it consists of sixteen Text OpenType fonts, a Roman family **KpRoman** in eight shapes and weights—*Regular, Italic, Bold, BoldItalic, Light, LightItalic, Semibold, SemiboldItalic*—, a Sans-Serif family **KpSans** and a TypeWriter family **KpMono**, each of them in four shapes and weights—*Regular, Italic, Bold* and *BoldItalic*— and five Math OpenType fonts **KpMath-Regular**, **KpMath-Bold**, **KpMath-Light**, **KpMath-Semibold** and **KpMath-Sans**.

KpRoman and **KpSans** families have small caps available in two sizes (SmallCaps and PetiteCaps), upper and lowercase digits (0123456789), ancient ligatures *ct*, *st* and *Q* a long-tailed capital *Q*. Superior and inferior digits and letters have been added to the OpenType **KpRoman** and **KpSans** fonts for footnotes' calls and abbreviations 1st, 2nd...

Latin and Greek letters are available in Upright and Italic shapes, in Bold and Regular weights, for all Math fonts: α β Γ Δ , α β Γ Δ , α β Γ Δ , α β Γ Δ .

Blackboard Bold capitals are available in two shapes, Serif and Sans: `\mathbb{ABC}` prints either $\mathbb{A}\mathbb{B}\mathbb{C}$ (default) or $\mathbb{A}\mathbb{B}\mathbb{C}$ (option `[Style=bbsans]`) Commands `\mathcal{ABC}` and `\mathscr{ABC}` print respectively \mathcal{ABC} and \mathscr{ABC} .

File `unimath-kpfonts.pdf` shows the full list of Unicode Math symbols provided by Kp-fonts, compared with other common Math fonts. More symbols, specific to Kp-fonts, are listed in section 3.2.

A style file `kpfont-otf.sty` is provided to load Kp-fonts easily. It is derived from `kpfont.sty` but options differ.

Please beware of the *experimental* status of the current version (0.39).

All fonts are covered by OFL licence, style file and documentation are under LPPL-1.3 licence.

1 Loading kpfonts-otf.sty

For users of the original kpfonts.sty package, the easiest way to try the OpenType version is to load kpfonts-otf.sty:

```
\usepackage[ options ]{kpfonts-otf}
```

this loads unicode-math (and fontspec) and defines **KpRoman** (Regular or Light depending on options), **KpSans** and **KpMono** as Text fonts, **KpMath** (Regular or Light depending on options) as Math fonts.

kpfonts-otf.sty also defines all symbols available in latexsym and amssymb under the same names¹ and a bunch of Kp-fonts specifics symbols.

1.1 Global options for both Text and Maths

light: switches to *light* fonts, metrics are unchanged; *light* fonts might not look perfect on screen but they print fine.

Please compare *regular* (left) and *light* fonts (right):

Normal or light? Just a matter of taste. $E = mc^2$	Normal or light? Just a matter of taste. $E = mc^2$
--	--

<i>Normal or light? Just a matter of taste</i>	<i>Normal or light? Just a matter of taste</i>
--	--

Normal or light? Just a matter of taste	Normal or light? Just a matter of taste
--	--

<i>Normal or light? Just a matter of taste</i>	<i>Normal or light? Just a matter of taste</i>
---	---

nomath: load neither unicode-math nor KpMath fonts; useful for documents without Maths, or to choose other Math fonts.

notext: do not change any Text font, use the defaults.

nosf: do not change Sans-Serif Text fonts, use the defaults.

nott: do not change Typewriter Text fonts, use the defaults.

onlyrm: equivalent to the last two combined.

fulloldstyle: equivalent to options oldstyle and oldstylemath.

fulloldstylenums: equivalent to options oldstylenums and oldstylenumsmath.

1.2 Options for Text fonts *only*

lighttext: switches to *light* Text fonts.

Two more weights are provided by kpfonts-otf.sty: with the *lighttext* (or *light*) option, *Semibold* and *Extrabold* vs *Light* and *Semibold* without it. These weights are available through \ltseries, \sbseries and \ebseries commands to be used in a group or alternatively through one argument commands \textlt{ }, \textsb{ } and \texteb{ }.

{\sbseries\itshape Foo} or \textsb{\textit{Foo}} print *Foo*.

1. Unicode names often differ from AMS names.

oldstylenums: provides lowercase digits as a default.

To get uppercase digits locally: `{\addfontfeature{Numbers=Lining} 123}`.

Examples, upright, italic, bold and bolditalic:

— `o123456789!`

— `o123456789!`

— `o123456789!`

— `o123456789!`

oldstyle: provides lowercase digits as a default, long-tailed Q (Quebec) and (for Roman and Sans-Serif fonts only) old style ligatures « ct » et « st ».

Examples:

— `Quest` for an attractive font!

— *Q^{ue}st for an attractive font!*

— **Q^{ue}st for an attractive font!**

— **Q^{ue}st for an attractive font!**

— *Q^{ue}st for an attractive font!*

— **Q^{ue}st for an attractive font!**

veryoldstyle: same as option `oldstyle` but the round ‘s’ is replaced by the long one ‘f’, unless it ends a word (then it remains ‘s’)² and ancient ligatures fi, fl, ft are activated. Coding `s=` prints a round ‘s’ anytime; in most cases this coding is not necessary with LuaTeX, f.i. `\textit{some of Highlands’ mysterious castles...}` will print *some of Highlands’ mysterious castles...* which is correct; with XeTeX an `=` sign must be added at the end of `mysterious=` to get a round ‘s’ there : final ‘s’ followed by a punctuation sign is never turned into ‘f’, when followed by a space it is a trickier, see option `longs` below.

longs inhibits the transformation of an ‘s’ followed by a space into ‘f’. This option, available only with LuaTeX, is silently switched on by `veryoldstyle`; it is used explicitly in the present document to deal with the examples of long ‘s’ shown in the preceeding item.

largesmallcaps: prints larger SMALL CAPS than the default ones (PETITE CAPS).

altfligs : prints alternative shapes for ligatures fi, fl, ffi, ffl instead of fi, fl, ffi, ffl.

germandbls : `\SS` prints SS instead of ß (capital *Eszett*), ditto for small/petite caps.

eurosym : replaces the Euro character (€) by the official symbol (€) (available in regular, italic, bold and et bolditalic) ; the `\KPeuro` command is also provided to print the official symbol, it accepts an optionnal argument : `\kpeuro[1,50]{}` prints 1,50 € (with a nobreak space).

harfbuzz : switches `Renderer=Harfbuzz` for HBLuaTeX engine; up to version 0.34, this renderer was silently activated but seldom useful.

1.3 Options for Math fonts *only*

lightmath: uses *light* Math fonts.

2. The OpenType `calt` feature is used to catch ‘s’ ending a word.

bbsans: command `\mathbb` prints Sans-Serif Blackboard Bold capitals with Serif fonts too: compare $\mathbb{C}, \mathbb{K}, \mathbb{N}, \mathbb{Q}, \mathbb{R}, \mathbb{Z}$, with $\mathbb{C}, \mathbb{K}, \mathbb{N}, \mathbb{Q}, \mathbb{R}, \mathbb{Z}$ (default).

frenchstyle: Latin uppercase letters and all Greek letters are printed upright, only lowercase latin letters are printed in italics; this follows the French typographic usage.

oldstylenumsmath: prints lowercase digits in Maths (default is uppercase).

narrowiints: prints condensed repeated integrals :

$\int\!\!\!\int$ et $\int\!\!\!\int\!\!\!\int$ instead of $\int\!\!\!\int$ et $\int\!\!\!\int\!\!\!\int$ (default).

partialup: the `\partial` symbol is printed upright ∂ instead of ∂ .

fancyReIm: commands `\Re` et `\Im` print \Re and \Im respectively instead of \Re et \Im .

tight: horizontal spaces tightened in math mode (same settings as `fourier-otf`).

noDcommand: do not define `\D` to avoid incompatibilities with other packages.

Option `mathcal` has been deleted: commands `\mathcal{ABC}` and `\mathscr{ABC}` now print ABC and \mathcal{ABC} respectively when `kpfonts-otf.sty` is loaded.

2 Another way to load Kp-fonts

Loading Kp-fonts through `kpfonts-otf.sty` offers only a limited choice of options; the standard commands `\setmainfont`, `\setsansfont`, `\setmonofont`, `\setmathfont` offer much more flexibility.

On the other hand, `kpfonts-otf.sty` defines a lot of useful commands to access AMS and specific Kp-fonts symbols. Loading `kpfonts-otf` with the `symbols` option enables to get all these commands defined without loading any font:

```
\usepackage[symbols]{kpfonts-otf}
```

Please note that `unicode-math`³ (and `fontspec`) are loaded by this procedure, no need to do it again, unless specific options are required, then `unicode-math` has to be loaded before `kpfonts-otf`, f.i.:

```
\usepackage[math-style=ISO,bold-style=upright]{unicode-math}
\usepackage[symbols]{kpfonts-otf}
```

Then, it is up to the user to load Kp-fonts with whatever option he/she likes using commands

```
\set...font{font}[options].
```

For documents requiring no Math fonts, loading `fontspec` and using the `\set...font` commands is enough, no need to load `kpfonts-otf` at all.

3. A careful reading of both manuals `unicode-math.pdf` and `fontspec.pdf` (available in all TeX distributions) is required in order to take full advantage of these packages.

2.1 Options for Text fonts

Here are the options available for Text Kp-fonts:

Numbers=Lowercase to get lowercase digits 1,2,3 instead of 1,2,3; the default is **Numbers=Lining**.

SmallCapsFeatures = {Letters=SmallCaps} the `\textsc{}` command will print larger SMALL CAPS than the default PETITE CAPS.

The default setting⁴, is **SmallCapsFeatures = {Letters=PetiteCaps}**.

Ligatures=TeX (default) ' !` ?` -- --- print respectively ' i ÿ - —.

Ligatures=Common (default) automatic ligatures ff ffi ffl fi fl.

StylisticSet=1 provides an alternative for glyphs ffi ffl fi fl (ff is unchanged).

Ligatures=Required : adds ft et tt ligatures.

Ligatures=Rare adds ct et st ligatures.

Style=Swash to get the long-tailed capital Q: Queen, also in small caps (both sizes): QUEEN and QUEEN.

Style=Historic replaces any instance of 's' by the long variant f. It is still possible to get a round 's' coding it as 's=' specially at end of words; see options `veryoldstyle` and `longs` p. 3 for more details.

Ligatures=Historic switches specific ligatures for the long f: fi, fl, ft.

StylisticSet=2 : \SS prints SS instead of ß (capital *Eszett*), ditto for small/petite caps.

StylisticSet=3 : replaces the Euro character (€) by the official symbol (€) (available in regular, italics, bold and et bolditalic).

Options may be are chosen for each font, say:

```
\setmonofont{KpMono}[Numbers=Lowercase,Style=Historic]
```

but can also be shared by different typefaces:

```
\defaultfontfeatures+[KpRoman,KpSans,KpMono]{Numbers=Lowercase}
\defaultfontfeatures+[KpRoman,KpSans]{%
  Ligatures = Rare,
  Style = Swash,
  SmallCapsFeatures = {Letters=PetiteCaps},
}
\setmainfont{KpRoman}
\setsansfont{KpSans}
\setmonofont{KpMono}
```

Notes : 1. `\setmonofont{KpMono}`, `\setsansfont{KpSans}`, `\setmainfont{KpRoman}` rely on files `KpMono.fontspec`, `KpSans.fontspec` and `KpRoman.fontspec` installed by Kpfonts.

4. Changed in v0.37 to match the original kpfonts package.

The first line loads **KpMath** as usual, the second one modifies `\mathcal{}` command's output.

The next four tables present the other Style Variants available:

Table 1 – Style=leqslant (+ss04)

Command	Default	Variant
<code>\leq</code>	\leq	\leqslant
<code>\geq</code>	\geq	\geqslant
<code>\nleq</code>	\nleq	\nleqslant
<code>\ngeq</code>	\ngeq	\ngeqslant
<code>\leqq</code>	\leqq	\leqslant
<code>\geqq</code>	\geqq	\geqslant
<code>\eqless</code>	\lessgtr	\lessgtr
<code>\eqgtr</code>	\gtrless	\gtrless
<code>\lesseqgtr</code>	\lesseqgtr	\lesseqgtr
<code>\gtreqless</code>	\gtreqless	\gtreqless
<code>\lesseqqgtr</code>	\lesseqqgtr	\lesseqqgtr
<code>\gtreqqless</code>	\gtreqqless	\gtreqqless

Table 2 – Style=smaller (+ss05)

Command	Default	Variant
<code>\mid</code>	\mid	\mid
<code>\nmid</code>	\nmid	\nmid
<code>\parallel</code>	\parallel	\parallel
<code>\nparallel</code>	\nparallel	\nparallel
<code>\parallelslant</code>	\parallel	\parallel
<code>\nparallelslant</code>	\nparallel	\nparallel

Table 3 – Style=subsetneq (+ss06)

Command	Default	Variant
<code>\subsetneq</code>	\subsetneq	\subsetneq
<code>\supsetneq</code>	\supsetneq	\supsetneq
<code>\subsetneqq</code>	\subsetneqq	\subsetneqq
<code>\supsetneqq</code>	\supsetneqq	\supsetneqq

Table 4 – Style=parallelslant (+ss07)

Command	Default	Variant
<code>\parallel</code>	\parallel	\parallel
<code>\nparallel</code>	\nparallel	\nparallel
<code>\shortparallel</code>	\parallel	\parallel
<code>\nshortparallel</code>	\nparallel	\nparallel

Example: switching styles 4 (leqslant) and 6 (subsetneq) can be achieved coding either `\setmathfont{KpMath-Regular.otf}[StylisticSet={4,6}]` or `\setmathfont{KpMath-Regular.otf}[Style={leqslant,subsetneq}]` but this second syntax is available only if `kpfonts-otf.sty` has been loaded (eventually with the `symbols` option).

Table 5 on the following page shows the available ‘Glyphs Variants’:

Example: with `\setmathfont{KpMath-Regular.otf}[CharacterVariant={3,6}]` commands `\epsilon` and `\phi` print ϵ and ϕ instead of ϵ et ϕ . The same is true of course for all shapes and and weights (upright, bold, bolditalic, sans-serif, etc.): f.i. with `math-style=french`, `\epsilon` and `\phi` print ϵ and ϕ .

Note about `\hbar`: `unicode-math` defines `\hbar` as `\hslash` (U+210F) while `amsmath` provides two different glyphs (italic h with horizontal or diagonal stroke). `kpfonts-otf` now follows `unicode-math`; the italic h with horizontal stroke can be printed using `\hslash` or `\hbar` together with character variant `cv01` or with `\mithbar`

Table 5 – Glyphs Variants

	Default		Variant		Command	
cv00	\Re	\mathbb{I}	\Re	\mathbb{I}	$\backslash\mathrm{Re}$	$\backslash\mathrm{Im}$
cv01	\hbar		\hbar		$\backslash\mathrm{hslash}$	or $\backslash\mathrm{hbar}$
cv02	\emptyset		\emptyset		$\backslash\mathrm{emptyset}$	
cv03	ε		ε		$\backslash\mathrm{epsilon}$	
cv04	κ		κ		$\backslash\mathrm{kappa}$	
cv05	π		ϖ		$\backslash\mathrm{pi}$	
cv06	ϕ		φ		$\backslash\mathrm{phi}$	
cv07	ρ		ρ		$\backslash\mathrm{rho}$	
cv08	σ		ς		$\backslash\mathrm{sigma}$	
cv09	θ		ϑ		$\backslash\mathrm{theta}$	
cv10	Θ		Θ		$\backslash\mathrm{Theta}$	

(replacement for AMS' command $\backslash\mathrm{hbar}$).

3 Kp-fonts specific commands

3.1 Integrals

Kp-fonts offers variants for integral symbols suitable for indefinite integrals, they are coded as $\backslash\mathrm{varint}$, $\backslash\mathrm{variint}$, $\backslash\mathrm{variiint}$, $\backslash\mathrm{variiiiint}$ and $\backslash\mathrm{varidotsint}$. Compare $\int f(t) dt$ and $\int f(t) dt$ and also

$$\int f(t) dt \quad \text{and} \quad \int f(t) dt$$

$\backslash\mathrm{D}\{\dots\}$ prints an upright 'd' and improves kernings around the differential element: $\backslash\mathrm{displaystyle}\backslash\mathrm{varint} f(t)\backslash\mathrm{D}\{t\}$ donne $\int f(t) dt$.

3.2 Specific Math symbols

The next tables present symbols unavailable as Unicode characters, they are coded in Kp-fonts' private zone.

$\backslash\mathrm{mmapsto}$	\mapsto	$\backslash\mathrm{longmmapsto}$	\mapsto
$\backslash\mathrm{mmapsfrom}$	\mapsfrom	$\backslash\mathrm{longmmapsfrom}$	\mapsfrom
$\backslash\mathrm{Mmapsto}$	\mapsto	$\backslash\mathrm{Longmmapsto}$	\mapsto
$\backslash\mathrm{Mmapsfrom}$	\mapsfrom	$\backslash\mathrm{Longmmapsfrom}$	\mapsfrom
$\backslash\mathrm{leftrightdasharrow}$	\leftrightarrow	$\backslash\mathrm{leadsto}$	\leadsto

<code>\boxright</code>	$\square\rightarrow$	<code>\boxleft</code>	$\leftarrow\square$
<code>\circcleright</code>	$\bigcirc\rightarrow$	<code>\circleleft</code>	$\leftarrow\bigcirc$
<code>\Diamondright</code>	$\diamond\rightarrow$	<code>\Diamondleft</code>	$\leftarrow\diamond$
<code>\boxdotright</code>	$\boxplus\rightarrow$	<code>\boxdotleft</code>	$\leftarrow\boxplus$
<code>\circledotright</code>	$\odot\rightarrow$	<code>\circledotleft</code>	$\leftarrow\odot$
<code>\Diamonddotright</code>	$\diamond\rightarrow$	<code>\Diamonddotleft</code>	$\leftarrow\diamond$

<code>\boxRight</code>	$\boxplus\Rightarrow$	<code>\boxLeft</code>	$\Leftarrow\boxplus$
<code>\boxdotRight</code>	$\boxplus\Rightarrow$	<code>\boxdotLeft</code>	$\Leftarrow\boxplus$
<code>\DiamondRight</code>	$\diamond\Rightarrow$	<code>\DiamondLeft</code>	$\Leftarrow\diamond$
<code>\DiamonddotRight</code>	$\diamond\Rightarrow$	<code>\DiamonddotLeft</code>	$\Leftarrow\diamond$

<code>\multimapdot</code>	$\multimap\bullet$	<code>\multimapdotinv</code>	$\bullet\multimap$
<code>\multimapdotboth</code>	$\bullet\multimap\bullet$		
<code>\multimapbothvert</code>	$\begin{smallmatrix} \circ \\ \bullet \end{smallmatrix}$	<code>\multimapdotbothvert</code>	$\begin{smallmatrix} \bullet \\ \circ \end{smallmatrix}$
<code>\multimapdotbothAvert</code>	$\begin{smallmatrix} \circ \\ \bullet \end{smallmatrix}$	<code>\multimapdotbothBvert</code>	$\begin{smallmatrix} \bullet \\ \circ \end{smallmatrix}$

<code>\capplus</code>	\capplus	<code>\sqcupplus</code>	\sqcupplus	<code>\sqcapplus</code>	\sqcapplus
<code>\parallelslant</code>	\parallel	<code>\colonsim</code>	$\colon\sim$	<code>\colonapprox</code>	$\colon\approx$
<code>\parallelbackslant</code>	\parallel	<code>\Colonsim</code>	$\colon\sim$	<code>\Colonapprox</code>	$\colon\approx$
<code>\eqqColon</code>	\equiv	<code>\Colondash</code>	$\colon-$	<code>\dashColon</code>	$\colon-$

<code>\strictif</code>	\rightarrow	<code>\strictfi</code>	\leftarrow	<code>\strictiff</code>	\leftrightarrow
<code>\circledvee</code>	\odot	<code>\circledwedge</code>	\oslash	<code>\circledbar</code>	\oplus
<code>\openJoin</code>	\times	<code>\opentimes</code>	\times	<code>\VvDash</code>	\Vdash
<code>\lambdaslash</code>	λ	<code>\lambdabar</code>	λ	<code>\Wr</code>	\wr

<code>\idotsint</code>	$\int\cdots\int$		
<code>\ointclockwise</code>	\oint	<code>\varointctrlockwise</code>	\oint
<code>\oiintclockwise</code>	\oiint	<code>\oiintctrlockwise</code>	\oiint
<code>\varoiintclockwise</code>	\varoiint	<code>\varoiintctrlockwise</code>	\varoiint
<code>\oiiiiintclockwise</code>	\oiiiiint	<code>\oiiiiintctrlockwise</code>	\oiiiiint
<code>\varoiiiiintclockwise</code>	\varoiiiiint	<code>\varoiiiiintctrlockwise</code>	\varoiiiiint
<code>\sqiiint</code>	\sqiiint	<code>\sqiiiint</code>	\sqiiiint

The full list of Unicode symbols available with Kp-fonts is shown in file `unimath-kpfonts.pdf`.

3.3 Wide accents

— `\widehat` and `\widetilde`

\hat{x} \widehat{xx} \widehat{xxx} \widehat{xxxx} \widehat{xxxxx} \widehat{xxxxxx} \tilde{x} \widetilde{xx} \widetilde{xxx} \widetilde{xxxx} \widetilde{xxxxx} \widetilde{xxxxxx}

— `\overline` and `\underline`

\overline{x} \overline{xy} \overline{xyz} $\overline{A \cup B}$ $\overline{A \cup (B \cap C) \cup D}$ $\underline{m+n+p}$

— `\wideoverbar`, `\widecheck` et `\widebreve`

\wideoverbar{x} \wideoverbar{xy} \wideoverbar{xyz} \widecheck{x} \widecheck{xxx} \widecheck{xxxxx} \widebreve{x} \widebreve{xxx} \widebreve{xxxxx}

— `\overparen` and `\underparen`

\overparen{x} \overparen{xy} \overparen{xyz} $\overparen{A \cup B}^{\circ}$ $\overparen{A \cup (B \cap C) \cup D}^{\circ}$ $\overparen{x+y}^2$ $\overparen{a+b+\dots+z}^{26}$

\underparen{x} \underparen{xz} \underparen{xyz} $\underparen{x+z}_2$ $\underparen{a+b+\dots+z}_{26}$

— `\overbrace` and `\underbrace`

\overbrace{a} \overbrace{ab} \overbrace{abc} \overbrace{abcd} \overbrace{abcde} $\overbrace{a+b+c}^3$ $\overbrace{a+b+\dots+z}^{26}$

\underbrace{a} \underbrace{ab} \underbrace{abc} \underbrace{abcd} \underbrace{abcde} $\underbrace{a+b+c}_3$ $\underbrace{a+b+\dots+z}_{26}$

— `\overrightarrow` and `\overleftarrow`

\overrightarrow{v} \overrightarrow{M} \overrightarrow{vv} \overrightarrow{AB} \overrightarrow{ABC} \overrightarrow{ABCD} $\overrightarrow{ABCDEFGH}$

\overleftarrow{v} \overleftarrow{M} \overleftarrow{vv} \overleftarrow{AB} \overleftarrow{ABC} \overleftarrow{ABCD} $\overleftarrow{ABCDEFGH}$

— Enfin `\widearc` and `\widearcarrow` (ou `\overrightarrow{arc}`)

\widearc{AMB} \widearc{AMB}

3.4 Math Versions

Different versions of the **KpMath** fonts may be defined in the document's preamble:

`\setmathfont{KpMath-Regular.otf}[version=base, options]`

`\setmathfont{KpMath-Bold.otf}[version=bold, options]`

`\setmathfont{KpMath-Semibold.otf}[version=semibold, options]`

`\setmathfont{KpMath-Sans.otf}[version=sans, options]`

`\setmathfont{KpMath-Light.otf}[version=light, options]`

then, it is easy to switch from one version to another one with `\mathversion{name}`.

Example⁶:

6. Option `CharacterVariant=3` changes ϵ into ε .

```

\setmathfont{KpMath-Regular.otf}[Style=leqslant, CharacterVariant=3]
\setmathfont{KpMath-Bold.otf}[version=bold,
    Style=leqslant, CharacterVariant=3]
\setmathfont{KpMath-Sans.otf}[version=sans,
    Style=leqslant, CharacterVariant=3]

```

Here is the same equation in three versions, normal, bold and Sans-Serif:

$$\mathbb{E}_i(N_i) = \sum_{n \geq 1} P_i(N_i \geq n) = \frac{\varepsilon_i}{1 - \varepsilon_i} < +\infty$$

```
\mathversion{bold}
```

$$\mathbb{E}_i(N_i) = \sum_{n \geq 1} P_i(N_i \geq n) = \frac{\varepsilon_i}{1 - \varepsilon_i} < +\infty$$

```
\mathversion{sans}
```

$$\mathbb{E}_i(N_i) = \sum_{n \geq 1} P_i(N_i \geq n) = \frac{\varepsilon_i}{1 - \varepsilon_i} < +\infty$$