The mathbb-one package

𝟙 for amssymb's \mathbb

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https://github.com/t-a-beck/mathbb-one

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1 Usage

amssymb's blackboard bold has no digits, so `\mathbb{1}` prints a stray symbol instead of an indicator function. Load mathbb-one and it works:

```
\usepackage{amssymb}
\usepackage{mathbb-one}
...
$\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A)$
```

gives $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A)$, and in a display

$$\mathbb{1}_{A\cap B} = \mathbb{1}_A\,\mathbb{1}_B, \qquad \sum_{i=1}^{n} \mathbb{1}\{X_i > t\} \le n.$$

The package changes nothing else. Other `\mathbb` letters stay amssymb's, and an ordinary 1 is not affected.

`\Bbbone` is also defined, under the same name unicode-math uses, so the source keeps working if the document later moves to LuaLaTeX with unicode-math. In that setup mathbb-one does nothing and the math font's own 1 is used.

mathbb-one works with pdfLaTeX, LuaLaTeX and XeLaTeX, and can be loaded before or after amssymb. It has no options and needs neither bbm nor bbm-macros.

2 OpenType version

Under LuaLaTeX or XeLaTeX with unicode-math the math font already has a 1. If you want bbm's instead, don't load mathbb-one; take the glyph from the OpenType font `mathbb-one.otf`, which contains only U+1D7D9:

```
\usepackage{unicode-math}
\setmathfont{NewCMMath-Regular.otf}
\setmathfont[range="1D7D9]{mathbb-one.otf}
```

This changes `\Bbbone`. unicode-math sets `\mathbb{1}` through its blackboard-digit alphabet instead, so for `\mathbb{1}` use `range={"1D7D9,bb/num}`. Then `\mathbb{0}`, `\mathbb{2}`, ... come out empty, because the font contains only the 1.

3 The glyph

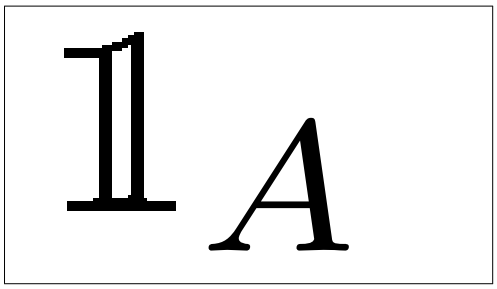
The 1 is the one from Gilles F. Robert's bbm fonts, the closest match to the Computer Modern style of amssymb's letters. bbm exists only as Metafont source, so pdfLaTeX embeds it as a 600 dpi bitmap. mathbb-one ships the 1 as Type 1 outlines, traced from high-resolution Metafont output. Its metrics are unchanged.

The 1 has three sizes, made from bbm5, bbm7 and bbm10. Like amssymb's msbm, the 10 pt design is scaled for every size from 8 pt up, so the 1 keeps the same weight relative to the letters at every size.

Before: bbm, \mathbbm{1}
600 dpi bitmap (Type 3)

Let $(\Omega, \mathcal{F}, \mathbb{P})$ be a probability space and $A \in \mathcal{F}$. The indicator $\mathbb{1}_A$ satisfies $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A)$, and

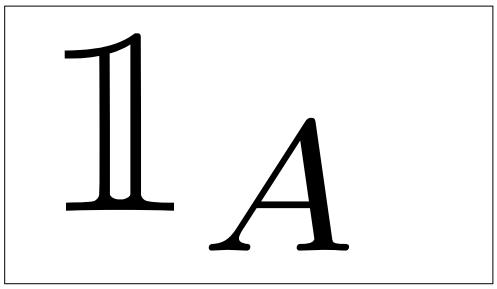
$$\mathbb{1}_{A\cap B} = \mathbb{1}_A\,\mathbb{1}_B, \qquad \sum_{i=1}^{n} \mathbb{1}\{X_i > t\} \le n.$$



With mathbb-one: \mathbb{1}
vector outlines (Type 1)

Let $(\Omega, \mathcal{F}, \mathbb{P})$ be a probability space and $A \in \mathcal{F}$. The indicator $\mathbb{1}_A$ satisfies $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A)$, and

$$\mathbb{1}_{A\cap B} = \mathbb{1}_A\,\mathbb{1}_B, \qquad \sum_{i=1}^{n} \mathbb{1}\{X_i > t\} \le n.$$



4 Alternatives

Every answer to TeX.SE question 26637, each set as the answer suggests, next to its \mathbb letters:

mathbb-one (new)
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

pdfLaTeX, keeps amssymb's letters

amssymb alone
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\nVdash$ $\mathbb{E}[\nVdash_A] = \mathbb{P}(A),\ \nVdash_{\{X>t\}}$

bbm (bitmap)
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

dsfont
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

bbold as an extra alphabet
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

dsserif as an extra alphabet
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

pdfLaTeX, replaces `\mathbb`

mathbbol
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

mathalpha bb=pazo
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

mathalpha bb=fourier
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

mathalpha bb=esstix
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

mathalpha bb=boondox
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

pdfLaTeX, replaces all math fonts

newtxmath [varbb] (Times)
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

newpxmath [varbb] (Palatino)
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

stix2
`\mathbb{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

LuaLaTeX / XeLaTeX with unicode-math

New Computer Modern Math
`\Bbbone`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

Latin Modern Math
`\Bbbone`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

Workarounds

bold one
`\mathbf{1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbf{1}$ $\mathbb{E}[\mathbf{1}_A] = \mathbb{P}(A),\ \mathbf{1}_{\{X>t\}}$

overprint hack
`\mathrm{1\!\!1}`

$\mathbb{N}\,\mathbb{R}\,\mathbb{E}\,\mathbb{1}$ $\mathbb{E}[\mathbb{1}_A] = \mathbb{P}(A),\ \mathbb{1}_{\{X>t\}}$

5 Licence

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