

# The `amsbsy` package

Frank Mittelbach      Rainer Schöpf      Michael Downes

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## 1 Introduction

The package `amsbsy`, first written in 1989, implements a few commands for producing **bold** characters in the ‘normal’ *math version*.

*Note: It is recommended nowadays to use the `bm` package, which became available in 1997.*

If we have bold fonts which contain the character in question then we will use these fonts to produce the wanted character. But sometimes math fonts are only available in a certain weight (e.g. the AMS symbol fonts). For these cases we provide a command which is called `\pmb` (an acronym for **p**oor **m**an’s **b**old) with one argument. The bolder weight is achieved by copying the argument three times in slightly different positions which is better than nothing but no match for a real bold font.

There also exists the `\boldsymbol` command which is better in all cases where bold fonts exists. This command will internally switch to the corresponding ‘bold’ *math version* typeset its argument in this version.

Both commands will preserve the nature of their arguments, i.e. if they get a relational atom their result will again be a relation as far as  $\mathrm{T}_{\mathrm{E}}\mathrm{X}$ ’s mathspacing is concerned.

Since it is good policy to make at least a small test we try to typeset the infinity sign ( $\infty$ ) first with `\pmb` and then with `\boldsymbol`.

$$\infty = \infty \quad ?$$

Standard package info.

```
1 \NeedsTeXFormat{LaTeX2e}% LaTeX 2.09 can't be used (nor non-LaTeX)
2 [1994/12/01]% LaTeX date must December 1994 or later
3 \ProvidesPackage{amsbsy}[1999/11/29 v1.2d]
```

## 2 The implementation

We need some functions from the `amsgen` package.

```
4 \RequirePackage{amsgen}
```

In implementing `\boldsymbol`, we must take into account  $\mathrm{T}_{\mathrm{E}}\mathrm{X}$ ’s limitation of only 16 mathgroups (math families, in Knuth’s terminology). If we wanted to maintain mathgroups for both the bold and non-bold version of each math font, it would not take long to run out of mathgroups. Therefore what we do instead for a bold symbol is embed it in an `\hbox`; inside that `\hbox`, when we start another math formula, we can change all the mathgroups to their bold equivalents.

However, to get the correct math style inside the `\hbox` (display, text, script or scriptscript) we have to use `\mathchoice`. Since `\mathversion{bold}` has

a lot of overhead, and `\mathchoice` typesets the argument text four times, we would rather not put the `\mathversion` command inside each `\hbox` in the `\mathchoice`; on the other hand, `\mathversion` gives an error message if it's used in math mode. Therefore if we want to execute `\mathversion{bold}` before starting the `\mathchoice` we have to temporarily disable the `\@nomath` error. (The error message is intended to keep people from accidentally emboldening a preceding part of a math formula, since only the mathgroups defined at the end of a math formula will determine the fonts used in that formula; but we are going to typeset our bold symbol not in the current formula but in an embedded formula, so that this danger doesn't apply here.)

```
5 \DeclareRobustCommand{\boldsymbol}[1]{%
```

Start a group to localize the change of `\@nomath`:

```
6 \begingroup
```

Disable `\@nomath` so that we don't have to leave math mode before executing `\mathversion`:

```
7 \let\@nomath\@gobble \mathversion{bold}%
```

`\math@atom` is a test macro which looks at its argument and produces a math atom of the proper class.

```
8 \math@atom{#1}{%
```

Although it is tempting to use `\text` here, to save some main memory, that caused a bug in the past due to some internal interactions with `\mathversion`.

```
9 \mathchoice%
```

```
10 {\hbox{$\m@th\displaystyle#1$}}%
```

```
11 {\hbox{$\m@th\textstyle#1$}}%
```

```
12 {\hbox{$\m@th\scriptstyle#1$}}%
```

```
13 {\hbox{$\m@th\scriptscriptstyle#1$}}}%
```

End the group we started earlier.

```
14 \endgroup}
```

`\math@atom` The macro `\math@atom` looks at its argument and produce a correct math atom, i.e. a primitive like `\mathopen`. Until the day we have a real implementation for all cases we use the `\binrel@` command from  $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{T}\mathcal{E}\mathcal{X}$  which can distinguish between binary, relation and ord atoms.

```
15 \def\math@atom#1#2{%
```

```
16 \binrel@{#1}\binrel@@{#2}}
```

`\pmb` Poor man's bold command, works by typesetting multiple copies of the given argument with small offsets.

```
17 \DeclareRobustCommand{\pmb}{%
```

```
18 \ifmmode\else \expandafter\pmb@@\fi\mathpalette\pmb@}
```

`\pmb@@` is called by `\pmb` in the non-math-mode case. Discard the first two arguments which are for the math-mode case.

```
19 \def\pmb@@#1#2#3{\leavevmode\setboxz@h{#3}%
```

```
20 \dimen@-\wdz@
```

```
21 \kern-.5\ex@ \copy\z@
```

```
22 \kern\dimen@\kern.25\ex@ \raise.4\ex@ \copy\z@
```

```
23 \kern\dimen@\kern.25\ex@ \box\z@
```

```
24 }
```

```
25 \newdimen\pmbraise@
```

Note: because of the use of `\mathpalette`, if `\pmb@` is applied to a single math italic character (or a single character from some other slanted math font), the

italic correction will be added. This will cause subscripts to fall too far away from the character in some cases, e.g.,  $T_1$  or  $\mathcal{T}_1$ .

```

26 \def\pmb@#1#2{\setbox8\hbox{\$ \m@th#1{#2}\$}%
27 \setboxz@h{\$ \m@th#1\mkern.5mu$\}\pmbraise@\wdz@
28 \binrel@{#2}%
29 \dimen@-\wd8 %
30 \binrel@@{
31 \mkern-.8mu\copy8 %
32 \kern\dimen@\mkern.4mu\raise\pmbraise@\copy8 %
33 \kern\dimen@\mkern.4mu\box8 }%
34 }

```

```

35 \def\binrel@#1{\begingroup
36 \setboxz@h{\thinmuskip0mu
37 \medmuskip\m@ne mu\thickmuskip\@ne mu
38 \setbox\tw@\hbox{\$#1\m@th$\}\kern-\wd\tw@
39 $\}\#1\}\m@th$\}%

```

The `\noexpand` here should be unnecessary, but just in case ...

```

40 \edef\@tempa{\endgroup\let\noexpand\binrel@@
41 \ifdim\wdz@<\z@ \mathbin
42 \else\ifdim\wdz@>\z@ \mathrel
43 \else \relax\fi\fi}%
44 \@tempa
45 }

```

For completeness, assign a default value for `\binrel@@`.

```
46 \let\binrel@@\relax
```

The usual `\endinput` to ensure that random garbage at the end of the file doesn't get copied by `docstrip`.

```
47 \endinput
```

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