

# The `amsbsy` package

Frank Mittelbach      Rainer Schöpf      Michael Downes

Version 1.2d, 1999/11/29

## 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@@{#2}%
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

```

## Index

Numbers written in *italic* refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in *roman* refer to the code lines where the entry is used.

<b>Symbols</b>	<code>\dimen@</code> ..... 20,	<code>\math@atom</code> ... 2, 8, <u>15</u>
<code>\@nomath</code> ..... 7	22, 23, 29, 32, 33	<code>\mathbin</code> ..... 41
<b>A</b>	<code>\displaystyle</code> ..... 10	<code>\mathchoice</code> ..... 9
AMSBY package ..... 2	<code>docstrip</code> ..... 3	<code>\mathpalette</code> .... 2, 18
ambsy package ..... 1	<b>E</b>	<code>\mathrel</code> ..... 42
amsgen package ..... 1	<code>\endinput</code> ..... 3	<code>\mathversion</code> ..... 7
	<code>\ex@</code> ..... 21, 22, 23	<code>\medmuskip</code> ..... 37
<b>B</b>		<code>\mkern</code> ... 27, 31, 32, 33
<code>\binrel@</code> ... 16, 28, 35	<b>H</b>	<b>N</b>
<code>\binrel@@</code> ..... 3, 16, 30, 40, 46	<code>\hbox</code> ..... 10,	<code>\NeedsTeXFormat</code> .... 1
bm package ..... 1	11, 12, 13, 26, 38	<code>\newdimen</code> ..... 25
<code>\boldsymbol</code> ..... 1, <u>5</u>	<b>K</b>	<code>\noexpand</code> ..... 3
<b>C</b>	<code>\kern</code> ..... 21,	<b>P</b>
<code>\copy</code> .... 21, 22, 31, 32	22, 23, 32, 33, 38	<code>\pmb</code> ..... 1, 2, 17
<b>D</b>	<b>M</b>	<code>\pmb@</code> ..... 2, 18, 26
<code>\DeclareRobustCommand</code>	<code>\m@ne</code> ..... 37	<code>\pmb@@</code> ..... 2, 18, 19
..... 5, 17	<code>\m@th</code> ... 10, 11, 12,	<code>\pmbraise@</code> . 25, 27, 32
	13, 26, 27, 38, 39	<code>\ProvidesPackage</code> ... 3

R		T		W	
<code>\raise</code> . . . . .	22, 32	<code>\setbox</code> . . . . .	26, 38	<code>\tw@</code> . . . . .	38
<code>\RequirePackage</code> . . . .	4	<code>\setboxz@h</code> . . . .	19, 27, 36		
S		T		W	
<code>\scriptscriptstyle</code> .	13	<code>\textstyle</code> . . . . .	11	<code>\wd</code> . . . . .	29, 38
<code>\scriptstyle</code> . . . . .	12	<code>\thickmuskip</code> . . . . .	37	<code>\wdz@</code> . . . .	20, 27, 41, 42
		<code>\thinmuskip</code> . . . . .	36		