The jkmath package

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1 The package options

The package contains a few options with regards to subsets.

subsetorder You are a person that likes your symbols for subsets to resemble the symbols used for ordering numbers. The command \subset now displays the symbol $\subseteq$ while a new command \stsubset (for strict subsets) can be used for displaying the symbol $\subset$. Similar behavior occurs with \supset and \stsupset.

subsetnonorder You are a person that likes variety. Your symbols for subsets do not resemble the usual ordering symbols. the command \subset displays the symbol $\subset$ while the symbol \stsubset displays as $\subset$. Same for supset and stsupset.

subsetnonamb You like your notation as unambiguous as possible. The command \subset displays the symbol $\subseteq$ while \stsubset displays $\subset$. Again similar for supset and stsupset.

The advantage of this approach is that you can convert a document from one style of notation to another by simply changing the package option.

There are also two options, bbsets and bfsets concerning the display of number systems. They provide the following shorthands:

<table>
<thead>
<tr>
<th>Command</th>
<th>Option</th>
<th>bbsets</th>
<th>Option</th>
<th>bfsets</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>\N</td>
<td>N</td>
<td>N</td>
<td></td>
<td></td>
<td>Natural numbers</td>
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<td>\Z</td>
<td>Z</td>
<td>Z</td>
<td></td>
<td></td>
<td>Integers</td>
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<tr>
<td>\Q</td>
<td>Q</td>
<td>Q</td>
<td></td>
<td></td>
<td>Rational numbers</td>
</tr>
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<td>\R</td>
<td>R</td>
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<td></td>
<td>Real numbers</td>
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<td>\C</td>
<td>C</td>
<td>C</td>
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<td>Complex numbers</td>
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<tr>
<td>\F</td>
<td>F</td>
<td>F</td>
<td></td>
<td></td>
<td>Fields</td>
</tr>
<tr>
<td>\Aff</td>
<td>A</td>
<td>A</td>
<td></td>
<td></td>
<td>Affine Space</td>
</tr>
<tr>
<td>\PP</td>
<td>P</td>
<td>P</td>
<td></td>
<td></td>
<td>Projective Space</td>
</tr>
</tbody>
</table>
2 Commands with arrays

2.1 Systems of equations

This package uses the array-package to define some useful math alignment. The first is the \texttt{system} environment. There are two new column types (e and o) to get the spacing around operators right. You can then call the code

\begin{system}{rorer}
4x & + & 3y & 7\\
2x & - & 5y & 10
\end{system}

to get the result

\[
\begin{align*}
4x + 3y &= 7 \\
2x - 5y &= 10
\end{align*}
\]

This allows fine control over the alignment of a system of equations while still having the correct spacing. Note that the column type e automatically inserts an equality sign.

2.2 Augmented matrices

A second class of commands are the augmented matrices. The environment \texttt{augmentedmatrix} takes two arguments \( n \) and \( m \) and makes a matrix of \( n+m \) columns with a vertical rule after the \( n \)-th column, allowing the typesetting of systems with (multiple) right hand sides in matrix form. The code

\begin{augmentedmatrix}{2}{2}
1 & 2 & 3 & 4\\
5 & 6 & 7 & 8
\end{augmentedmatrix}

has the following output:

\[
\begin{array}{cc|cc}
1 & 2 & 3 & 4 \\
5 & 6 & 7 & 8
\end{array}
\]

At the moment there are two shorthand commands \texttt{apmqty} and \texttt{ipmqty} which take \( m = 1 \) and \( m = n \) respectively and insert parentheses. These are used for solving systems with one right hand side and for calculating inverse matrices. The shorthand name is inspired by the shorthands in the \texttt{physics}-package. The code
\begin{verbatim}
\amqty{2}{1 & 2 & 3 \ \ \ \ \ \ \ 4 & 5 & 6}
\neq
\ipmqty{3}{0 & 1 & 0 & 1 & 0 & 0\ 
-1 & 0 & 2 & 0 & 1 & 0\ 
0 & 0 & 3 & 0 & 0 & 1}
\end{verbatim}
produces the following output:

\[
\begin{pmatrix}
1 & 2 & 3 \\
4 & 5 & 6
\end{pmatrix}
\neq
\begin{pmatrix}
0 & 1 & 0 & 1 & 0 & 0 \\
-1 & 0 & 2 & 0 & 1 & 0 \\
0 & 0 & 3 & 0 & 0 & 1
\end{pmatrix}
\]

\section{Delimiters and intervals}

I often use a script to check if my code is consistent in its use of delimiters since \LaTeX allows you to have unmatched parentheses etc. in the text. The commands \texttt{\lbrace}, \texttt{\rbrace}, \texttt{\lbrack} and \texttt{\rbrack} are a godsend when I both want my script to give meaningful output and I only need one delimiter (such as in the \texttt{system} environment). This package defines similar commands \texttt{\lparens} and \texttt{\rparens} for parentheses.

Using these delimiter commands the package also defines four types of intervals: \texttt{\oointerval}, \texttt{\ccinterval}, \texttt{\ocinterval} and \texttt{\cointerval}. The o and c say whether the left or right endpoint is open or closed. The code

\begin{verbatim}
\cointerval{1,3} \cup \ccinterval{3,7} = \ccinterval{1,7}
\end{verbatim}

typesets the following output

\[
[1, 3) \cup [3, 7] = [1, 7].
\]

You can define your own shorthands for these commands or redefine the style of the intervals.

\section{Sets}

A general macro for denoting sets is \texttt{\set} which automatically places scalable braces around the argument. A scalable version of \texttt{\mid}, called \texttt{\where}, is also included. This makes sure the (readable) code

\begin{verbatim}
\set{x \in \mathbb{R}} \where \frac{3}{4}x + 5 = 0
\end{verbatim}

will give the following result:

\[ \left\{ x \in \mathbb{R} \ \bigg| \ \frac{3}{4}x + 5 = 0 \right\}. \]

A second macro is \texttt{\textbackslash restr} for denoting restrictions of functions to subsets of their domain. Simple usage is \texttt{\textbackslash restr\{f\}_U} which displays \( f|_U \).

5 Combinatorics

Using \texttt{\textbackslash genfrac} from \texttt{amsmath} the package defines two commands for Stirling numbers of the first and second kind. Example usage:

\begin{verbatim}
\stirlingfirstkind{n}{k} = \\
\stirlingsecondkind{-k}{-n}
\end{verbatim}

gives the output

\[
\begin{bmatrix} n \\ k \end{bmatrix} = \begin{bmatrix} -k \\ -n \end{bmatrix}.
\]

Shorthands for these two commands have yet to be defined.

6 Number Theory

Two commands (with identical results) \texttt{\textbackslash legendre} and \texttt{\textbackslash jacobi} are defined to typeset Legendre symbols and Jacobi symbols. The output is identical but their name differs to make the code more readable. Example usage:

\begin{verbatim}
\jacobi{a}{n} = \\
\legendre{a}{p_1}^{e_1} \\
\legendre{a}{p_2}^{e_2} \cdots \\
\legendre{a}{p_k}^{e_k}
\end{verbatim}

gives the output

\[
\left( \frac{a}{n} \right) = \left( \frac{a}{p_1} \right)^{e_1} \left( \frac{a}{p_2} \right)^{e_2} \cdots \left( \frac{a}{p_k} \right)^{e_k}
\]

7 Names of mathematicians

This section describes three simple commands \texttt{\textbackslash mobius}, \texttt{\textbackslash cech} and \texttt{\textbackslash erdos} so you can mention Mőbius, Čech and Erdős without any pain.