

The background of the page is a dense, overlapping pattern of stylized document icons. Each icon consists of a white rectangular border enclosing a dark gray rectangle with several horizontal white lines, representing text. The icons are scattered across the entire page, creating a textured, layered effect.

ConT_EXt

title : Math Sets
subtitle : ConT_EXt port of braket.sty
author : Aditya Mahajan
date : April 11, 2007

`\definemathset 2`

`\setupmathset 2`

1 Introduction

I write a lot of probability expressions, which look like

$$E \left\{ \sum_y f(X, y) \middle| Z \right\}$$

which is typed as

```
\startformula
\mfunction{E} \left\{ \sum_{y} f(X,y) \,\,\middle|\,\, Z \right\}
\stopformula
```

The markup is a bit crowded, because the delimiters should scale properly, and so should the *conditional* sign `|`. Moreover the spacing around the conditional sign should be correct. This ensures that the resultant `TEX` code is almost unreadable. In `ℳTEX` I used to use Donald Arseneau's `braket.sty` to typeset should expressions. `CONTEXT` does not have anything similar. So, this is a port of `braket.sty` functionality to `CONTEXT`. I have not ported everything, only the features that I use.

2 Usage

To use this module add

```
\usemodule[mathsets]
```

on the top of your file. Now, a new *set* can be defined as follows:

```
\definemathset[EXP] [text=\mfunction{E}]
\definemathset[PR] [text={\mfunction{Pr}},left=(,right=)]
```

After which you can use

```
\startformula
\EXP{f(X) | Y = y} = \sum_{x} f(x) \PR{x|Y = y}
\stopformula
and
\startformula
\EXP{ \sum_y f(X,y) | Z = z } = \sum_{x,y} \PR{x,y | Z=z}
\stopformula
```

$$E \{ f(X) | Y = y \} = \sum_x f(x) \Pr (x | Y = y)$$

and

$$E \left\{ \sum_y f(X, y) \middle| Z = z \right\} = \sum_{x,y} \Pr (x, y | Z = z)$$

Only one set, `\mathset`, is predefined. It is relatively simple to define sets equivalent to those defined in `braket.sty`.

```
\definemathset[BRACKET] [left=\langle,right=\rangle]
```

```

\startformula
  \BRAKET{ \phi | \frac{\partial^2}{\partial t^2} | \psi }
  \quad
  \mathset{ x\in {\bf R}^2 | 0<{|x|}<5 }
\stopformula

```

$$\left\langle \phi \left| \frac{\partial^2}{\partial t^2} \right| \psi \right\rangle \quad \{x \in \mathbf{R}^2 \mid 0 < |x| < 5\}$$

Notice that the `|` protected by `{|}` did not get expanded in the second expression.

The expressions can also be nested, so

```

\startformula
  \EXP{ \sum_{Y} \EXP { \frac{1}{f(X)} | Y } }
\stopformula

```

$$E \left\{ \sum_Y E \left\{ \frac{1}{f(X)} \mid Y \right\} \right\}$$

3 Implementation

Most of the ideas are simply a CONTEXtified version of the code in `braket.sty`

```

1 \writestatus {loading} {ConTeXt Math Sets Module}
2 \startmodule[mathsets]
3 \unprotect

```

Since two letter codes are reserved for system modules, and CONTEXt seems to be running out of those, I choose a more verbose variable to store options.

```

4 \definesystemvariable {mathset} % Math Set

```

`\setupmath..` To specify the default values of left, middle, and right delimiters

```

5 \def\setupmathset
  {\dosingleargument\getparameters[\??mathset]}
6 \def\definemathset
  {\dodoubleargument\dodefinemathset}

```

`\definemat..` To define new math delimiters

```

7 \let\currentmathset\empty
  \let\currentmathsetgrouplevel\empty
8 \def\mathsetmiddle
  {\ifnum\currentmathsetgrouplevel=\currentgrouplevel
    \expandafter\firstoftwoarguments
  \else
    \expandafter\secondoftwoarguments
  \fi
  {\egroup\;\middle\mathsetparameter\c!middle\;\bgroup}
  {\mathsetparameter\c!middle}}

```

```

9 \def\mathsetparameter#1%
  {\executeifdefined{\??mathset\currentmathset#1}{\executeifdefined{\??mathset#1}\empty}}
10 \def\doddefinemathset[#1][#2]%
    {\getparameters[\??mathset#1][#2]
     \setvalue{#1}{\doddefinemathset[#1]}}

```

Since `|` is already active, we do not have to make it active again.

```

11 \def\dododdefinemathset[#1]#2#%
    {\begingroup
     \def\currentmathset{#1}
     \edef\currentmathsetgrouplevel{\the\numexpr\currentgrouplevel+2\relax}
     \mathcode'\|32768
     \let|\mathsetmiddle
     \def\mathsetarguments{#2}
     \dododdefinemathset}

```

The extra group in the definition of `dododdefinemathset` is so that such expressions turn out correct

$$E\left\{\left(\frac{a}{b}\right) \middle| \left(\frac{a}{\sum c}\right)\right\}$$

```

12 \def\dododdefinemathset#1%
    {\doifelsenothing{\mathsetparameter\c!text}
     {\mathopen{}\left\mathsetparameter\c!left
      {#1}
      \right\mathsetparameter\c!right\mathclose{}}
     {\mathop{\mathsetparameter\c!text\kern\zeropoint\mathsetarguments}
      \left\mathsetparameter\c!left
      {#1}
      \right\mathsetparameter\c!right}
     \endgroup}

```

The `\left` and `\right` generate a math atom of type inner, while for math sets, we want a math math open atom. To see the difference, consider

```

\startformula
2\left(\frac {3}{4} \right) \quad \quad \quad \hbox{ vs } \quad \quad \quad
2\biggl( \frac {3}{4} \biggr)
\stopformula
and
\startformula
\Pr\left(\frac {3}{4} \right) \quad \quad \quad \hbox{ vs } \quad \quad \quad
\Pr\biggl( \frac {3}{4} \biggr)
\stopformula

```

$$2\left(\frac{3}{4}\right) \quad \text{vs} \quad 2\biggl(\frac{3}{4}\biggr)$$

and

$$\Pr\left(\frac{3}{4}\right) \quad \text{vs} \quad \Pr\biggl(\frac{3}{4}\biggr)$$

I will assume that if `text` is something, then the default behaviour is desirable, if `text` is empty, then I add `\mathopen` and `\mathclose`. Using `\mathopen` to correct the spacing is due to Frank Mittelbach, see <http://www.latex-project.org/cgi-bin/ltxbugs2html?pr=latex/3853> With `mathset`, you get

$$2\left(\frac{3}{4}\right) \quad \text{vs} \quad \Pr\left(\frac{3}{4}\right)$$

which was typed as

```
\definemathset[SET][left=(,right=)]
\startformula
2\SET{\frac{3}{4}} \qqquad \hbox{ vs } \qqquad
\PR{ \frac{3}{4} }
\stopformula
```

Also, if its argument is a single character, `\mathop` centers it to with respect to the `math`-axis. I have added a `\kern\zeropoint` to prevent that.

```
13 \setupmathset
    [ \c!left={\{} ,
      \c!right={\}},
      \c!middle=\vert,
      \c!text=,]

14 \definemathset[mathset]

15 \stopmodule

16 \protect
```

`\definemathset 2`

`\setupmathset 2`

