The mdwmath* package

Mark Wooding

11 April 1996

Contents

1 User guide ............................ 1
   1.1 Square root typesetting . 1
   1.2 Some maths symbols you already have ............. 1

2 Implementation ....................... 2
   2.1 Square roots ..................... 2
      2.1.1 Where is the square root sign? . 2
      2.1.2 Drawing fake square root signs . 2
      2.1.3 The new square root command . . 4
   2.2 Some magic new maths characters ......... 5
   2.3 Biggles ........................... 5

A The GNU General Public Licence ......... 6
   A.1 Preamble .......................... 6
   A.2 Terms and conditions for copying, distribution and modification ...... 7
   A.3 Appendix: How to Apply These Terms to Your New Programs ........ 11

1 User guide

1.1 Square root typesetting

The package supplies a star variant of the \sqrt command which omits the vinculum over the operand (the line over the top). While this is most useful in simple cases like \sqrt{2} it works for any size of operand. The package also re-implements the standard square root command so that it positions the root number rather better.

[Note that omission of the vinculum was originally a cost-cutting exercise because the radical symbol can just fit in next to its operand and everything ends up being laid out along a line. However, I find that the square root without vinculum is less cluttered, so I tend to use it when it doesn’t cause ambiguity.]

1.2 Some maths symbols you already have

Having just tried to do some simple things, I’ve found that there are maths symbols missing. Here they are, in all their glory:

*The mdwmath package is currently at version 1.1, dated 11 April 1996.
Examples of the new square root command

\[
\sqrt{2} \quad \text{rather than} \quad \sqrt{\frac{2}{}}
\]
\[
\sqrt{2} \quad \text{rather than} \quad \sqrt{\frac{2}{}}
\]
\[
x = \sqrt[3]{\frac{3y}{7}}
\]
\[
q = \frac{2\sqrt{2}}{5} + \sqrt[5]{2x^2 + 3xy - y^2}
\]

2 Implementation

This isn’t really complicated (honest) although it is a lot hairier than I think it ought to be.

1 \text{\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered}\textasciitilde{\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered}\textasciitilde

2.1 Square roots

2.1.1 Where is the square root sign?

\text{\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered}\textasciitilde{\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered}

2.1.2 Drawing fake square root signs

\text{\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered\textasteriskcentered}\textasciitilde
\sqrtdel  This does the main job of typesetting a vinculum-free radical.\footnote{Note for chemists: this is nothing to do with short-lived things which don’t have their normal numbers of electrons. And it won’t reduce the appearance of wrinkles either.} It’s more or less a duplicate of what \TeX does internally, so it might be a good plan to have a copy of Appendix G open while you examine this.

We start off by using \texttt{\mathpalette} to help decide how big things should be.

\def\sqrtdel\mathpalette\sqrtdel@i

Read the contents of the radical into a box, so we can measure it.

\def\sqrtdel@i#1#2{% 
  \setbox\z@\hbox{$\m@th#1#2$} %%% Bzzzt -- uncramps the mathstyle
  Now try and sort out the values needed in this calculation. We’ll assume that $\xi$ is 0.6 pt, the way it usually is. Next try to work out the value of $\phi$.

11 \ifx#1\displaystyle% 
12 \@tempdima1ex% 
13 \else% 
14 \@tempdima.6\p@% 
15 \fi% 

That was easy. Now for $\psi$.

17 \@tempdimb.6\p@% 
18 \advance\@tempdimb.25\@tempdima% 

Build the ‘delimiter’ in a box of height $h(x) + d(x) + \psi + \xi$, as requested. Box 2 will do well for this purpose.

19 \dimen@.6\p@% 
20 \advance\dimen@\@tempdimb% 
21 \advance\dimen@\ht\z@% 
22 \advance\dimen@\dp\z@% 
23 \setbox\tw@\hbox{% 
24 $\left\sq@delim\vcenter to\dimen@{}\right.$% 
25 \kern\@tempdimb% 
26}% 

Now we need to do some more calculating (don’t you hate it?). As far as Appendix G is concerned, $\theta = h(y) = 0$, because we want no rule over the top.

27 \advance\@tempdima\ht\tw@% 
28 \advance\@tempdima\dp\tw@% 
29 \advance\@tempdima\ht\z@% 
30 \advance\@tempdima\dp\z@% 
31 \ifdim\@tempdim@<\@tempdima% 
32 \advance\@tempdima\@tempdima% 
33 \advance\@tempdim@\ht\tw@% 
34 \ifdim\@tempdim@<\@tempdima% 
35 \advance\@tempdima\@tempdima% 
36 \advance\@tempdima\ht\tw@% 

Work out how high to raise the radical symbol. Remember that Appendix G thinks that the box has a very small height, although this is untrue here.

37 \raise\@tempdima\box\tw@\vbox{\kern\@tempdima\box\z@}}%
2.1.3 The new square root command

This is where we reimplement all the square root stuff. Most of this stuff comes from the Plain\TeX macros, although some is influenced by \AMS-\TeX and \LATEX\varepsilon, and some is original. I’ve tried to make the spacing vaguely automatic, so although it’s not configurable like \AMS-\TeX’s version, the output should look nice more of the time. Maybe.

\sqrt \ \LATEX says this must be robust, so we make it robust. The first thing to do is to see if there’s a star and pass the appropriate squareroot-drawing command on to the rest of the code.

39 \DeclareRobustCommand{\sqrt}\{@ifstar{\sqrt@i\sqrtdel}{\sqrt@i\sqrtsign}\}

Now we can sort out an optional argument to be displayed on the root.

40 \def{\sqrt@i}\@ifnextchar[\{\sqrt@ii\}\{\sqrt@iv\}\}

Stages 2 and 3 below are essentially equivalents of Plain\TeX’s \root...\of and \r@@t. Here we also find the first wrinkle: the \rootbox used to store the number is spaced out on the left if necessary. There’s a backspace after the end so that the root can slip underneath, and everything works out nicely. Unfortunately size is fixed here, although doesn’t actually seem to matter.

41 \def{\sqrt@ii}\@ifnextchar[\{\sqrt@ii\}\{\sqrt@iv\}\}

Now we can actually build everything. Note that the root is raised by its depth – this prevents a common problem with letters with descenders.

48 \def{\sqrt@iii}\@ifstar{\sqrt@iii\#1\#2\#3}{\sqrt@iii\#1\#2\#3}\}

Finally handle a non-numbered root. We read the rooted text in as an argument, to stop problems when people omit the braces. (\AMS-\TeX does this too.)

59 \def{\sqrt@iv}\@ifstar{\sqrt@iv\#1\#2\#3}{\sqrt@iv\#1\#2\#3}\}

\root We also re-implement Plain\TeX’s \root command, just in case someone uses it, and supply a star-variant. This is all very trivial.

60 \def{\root}\@ifstar{\root\@i\sqrt\del}{\root\@i\sqrt\sign}\}

61 \def{\root\@i\#1\#2\of}\{\sqrt\@i\#1\#2\}

4
2.2 Some magic new maths characters

This is all really easy.

\DeclareMathSymbol{&}{\mathbin}{operators}{\&}
\DeclareMathSymbol{\bitand}{\mathbin}{operators}{\&}
\def\bitor{\mathbin\mid}
\def\dblor{\mathbin{\mid\mid}}
\def\dbland{\mathbin{\bitand\bitand}}

2.3 Biggles

Now for some user-controlled delimiter sizing. The standard bigness of plain \TeX’s delimiters are all right, but it’s a little limiting.

The bigness of delimiters is based on the size of the current \strut, which \TeX keeps up to date all the time. This will make the various delimiters grow in proportion when the text gets bigger. Actually, I’m not sure that this is exactly right – maybe it should be nonlinear.

\bbigg This is where the bigness is done. This is more similar to the plain \TeX big delimiter stuff than to the amsmath stuff, although there’s not really a lot of difference.

The two arguments are a multiplier for the delimiter size, and a small increment applied before the multiplication (which is optional).

This is actually a front for a low-level interface which can be called directly for efficiency.

\bbigg This is at last. The arguments are as described above: an addition to be made to the strut height, and a multiplier. Oh, and the delimiter, of course.

\bbigg This is a bit messy. The smallest ‘big’ delimiter, \big, is the same height as the current strut box. Other delimiters are 1\frac{1}{2}, 2\frac{2}{3}, and 2\frac{1}{2} times this height. I’ll set the height of the delimiter by putting in a \texttt{\vcenter} of the appropriate size.

Given an extra height \(x\), a multiplication factor \(f\) and a strut height \(h\) and depth \(d\), I’ll create a \texttt{\vcenter} with total height \(f(h + d + x)\). Easy, isn’t it?

\bbigg This is it, last. The arguments are as described above: an addition to be made to the strut height, and a multiplier. Oh, and the delimiter, of course.

This is a bit messy. The smallest ‘big’ delimiter, \big, is the same height as the current strut box. Other delimiters are 1\frac{1}{2}, 2\frac{2}{3}, and 2\frac{1}{2} times this height. I’ll set the height of the delimiter by putting in a \texttt{\vcenter} of the appropriate size.

Given an extra height \(x\), a multiplication factor \(f\) and a strut height \(h\) and depth \(d\), I’ll create a \texttt{\vcenter} with total height \(f(h + d + x)\). Easy, isn’t it?
Now for the easy macros.
\def\big{\bbigg@\z@\@ne}
\def\Big{\bbigg@\z@{1.5}}
\def\bigg{\bbigg@\z@\tw@}
\def\Bigg{\bbigg@\z@{2.5}}

That’s all there is. Byebye.

Appendix

A The GNU General Public Licence

The following is the text of the GNU General Public Licence, under the terms of which this software is distributed.

GNU GENERAL PUBLIC LICENSE
Version 2, June 1991
Copyright (C) 1989, 1991 Free Software Foundation, Inc.
675 Mass Ave, Cambridge, MA 02139, USA
Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

A.1 Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software—to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation’s software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.
We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author’s protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors’ reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone’s free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

A.2 Terms and conditions for copying, distribution and modification

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The “Program”, below, refers to any such program or work, and a “work based on the Program” means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term “modification”.) Each licensee is addressed as “you”.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program’s source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:
(a) You must cause the modified files to carry prominent notices stating
that you changed the files and the date of any change.

(b) You must cause any work that you distribute or publish, that in whole
or in part contains or is derived from the Program or any part thereof,
to be licensed as a whole at no charge to all third parties under the
terms of this License.

(c) If the modified program normally reads commands interactively when
run, you must cause it, when started running for such interactive use in
the most ordinary way, to print or display an announcement including
an appropriate copyright notice and a notice that there is no warranty
(or else, saying that you provide a warranty) and that users may redistri-
but e the program under these conditions, and telling the user how to
view a copy of this License. (Exception: if the Program itself is inter-
active but does not normally print such an announcement, your work
based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable
sections of that work are not derived from the Program, and can be rea-
sonably considered independent and separate works in themselves, then this
License, and its terms, do not apply to those sections when you distribute
them as separate works. But when you distribute the same sections as part of
a whole which is a work based on the Program, the distribution of the whole
must be on the terms of this License, whose permissions for other licensees
extend to the entire whole, and thus to each and every part regardless of
who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights
to work written entirely by you; rather, the intent is to exercise the right
to control the distribution of derivative or collective works based on the
Program.

In addition, mere aggregation of another work not based on the Program
with the Program (or with a work based on the Program) on a volume of
a storage or distribution medium does not bring the other work under the
scope of this License.

3. You may copy and distribute the Program (or a work based on it, under
Section 2) in object code or executable form under the terms of Sections 1
and 2 above provided that you also do one of the following:

(a) Accompany it with the complete corresponding machine-readable
source code, which must be distributed under the terms of Sections
1 and 2 above on a medium customarily used for software interchange;
or,

(b) Accompany it with a written offer, valid for at least three years, to
give any third party, for a charge no more than your cost of physically
performing source distribution, a complete machine-readable copy of
the corresponding source code, to be distributed under the terms of
Sections 1 and 2 above on a medium customarily used for software
interchange; or,
(c) Accompany it with the information you received as to the offer to dis-
tribute corresponding source code. (This alternative is allowed only
for noncommercial distribution and only if you received the program
in object code or executable form with such an offer, in accord with
Subsection b above.)

The source code for a work means the preferred form of the work for making
modifications to it. For an executable work, complete source code means
all the source code for all modules it contains, plus any associated interface
definition files, plus the scripts used to control compilation and installation of
the executable. However, as a special exception, the source code distributed
need not include anything that is normally distributed (in either source or
binary form) with the major components (compiler, kernel, and so on) of
the operating system on which the executable runs, unless that component
itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the source
code from the same place counts as distribution of the source code, even
though third parties are not compelled to copy the source along with the
object code.

4. You may not copy, modify, sublicense, or distribute the Program except
as expressly provided under this License. Any attempt otherwise to copy,
modify, sublicense or distribute the Program is void, and will automatically
terminate your rights under this License. However, parties who have received
copies, or rights, from you under this License will not have their licenses
terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it.
However, nothing else grants you permission to modify or distribute the Pro-
gram or its derivative works. These actions are prohibited by law if you do
not accept this License. Therefore, by modifying or distributing the Program
(or any work based on the Program), you indicate your acceptance of this
License to do so, and all its terms and conditions for copying, distributing
or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Pro-
gram), the recipient automatically receives a license from the original licen-
sor to copy, distribute or modify the Program subject to these terms and
conditions. You may not impose any further restrictions on the recipients’
exercise of the rights granted herein. You are not responsible for enforcing
compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringemen-
t or for any other reason (not limited to patent issues), conditions are imposed
on you (whether by court order, agreement or otherwise) that contradict the
conditions of this License, they do not excuse you from the conditions of
this License. If you cannot distribute so as to satisfy simultaneously your
obligations under this License and any other pertinent obligations, then as
a consequence you may not distribute the Program at all. For example, if a
patent license would not permit royalty-free redistribution of the Program by
all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and “any later version”, you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. Because the Program is licensed free of charge, there is no warranty for the Program, to the extent permitted by applicable law, except when otherwise stated in writing the copyright holders
and/or other parties provide the program “as is” without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The entire risk as to the quality and performance of the Program is with you. Should the Program prove defective, you assume the cost of all necessary servicing, repair or correction.

12. In no event unless required by applicable law or agreed to in writing will any copyright holder, or any other party who may modify and/or redistribute the program as permitted above, be liable to you for damages, including any general, special, incidental or consequential damages arising out of the use or inability to use the program (including but not limited to loss of data or data being rendered inaccurate or losses sustained by you or third parties or a failure of the Program to operate with any other programs), even if such holder or other party has been advised of the possibility of such damages.

END OF TERMS AND CONDITIONS

A.3 Appendix: How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the “copyright” line and a pointer to where the full notice is found.

<one line to give the program’s name and a brief idea of what it does.>
Copyright (C) 19yy <name of author>

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 675 Mass Ave, Cambridge, MA 02139, USA.

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:
Gnomovision version 69, Copyright (C) 19yy name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type 'show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type 'show c' for details.

The hypothetical commands 'show w' and 'show c' should show the appropriate
parts of the General Public License. Of course, the commands you use may be
called something other than 'show w' and 'show c'; they could even be mouse-clicks
or menu items—whatever suits your program.
You should also get your employer (if you work as a programmer) or your
school, if any, to sign a “copyright disclaimer” for the program, if necessary. Here
is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program
Gnomovision (which makes passes at compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice

This General Public License does not permit incorporating your program into
proprietary programs. If your program is a subroutine library, you may consider
it more useful to permit linking proprietary applications with the library. If this
is what you want to do, use the GNU Library General Public License instead of
this License.

Index

Numbers written in italic refer to the page where the corresponding entry is de-
scribed, the ones underlined to the code line of the definition, the rest to the code
lines where the entry is used.

<table>
<thead>
<tr>
<th>Symbol(s)</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\#</td>
<td>5</td>
</tr>
<tr>
<td>\&amp;</td>
<td>62, 63</td>
</tr>
<tr>
<td>@bbigg</td>
<td>67–70, 71</td>
</tr>
<tr>
<td>@bigg@</td>
<td>71, 72</td>
</tr>
<tr>
<td>@ifnextchar</td>
<td>40, 71</td>
</tr>
<tr>
<td>@ifstar</td>
<td>39, 60</td>
</tr>
<tr>
<td>@tempdima</td>
<td>13, 15, 18, 26–32, 34–37</td>
</tr>
<tr>
<td>@tempdimb</td>
<td>17, 18, 20, 30–32, 35, 37</td>
</tr>
<tr>
<td>[</td>
<td>4</td>
</tr>
<tr>
<td>|</td>
<td>4</td>
</tr>
<tr>
<td>\bbigg</td>
<td>67</td>
</tr>
<tr>
<td>\bbigg@</td>
<td>72, 74</td>
</tr>
<tr>
<td>\bbigg@1</td>
<td>67</td>
</tr>
<tr>
<td>\bbiggm</td>
<td>67</td>
</tr>
<tr>
<td>\bbigg@1</td>
<td>67</td>
</tr>
<tr>
<td>\Big</td>
<td>51</td>
</tr>
<tr>
<td>\big</td>
<td>51</td>
</tr>
<tr>
<td>\Bigg</td>
<td>51</td>
</tr>
<tr>
<td>\bitand</td>
<td>63, 66</td>
</tr>
<tr>
<td>\bitor</td>
<td>64</td>
</tr>
<tr>
<td>\dbland</td>
<td>66</td>
</tr>
<tr>
<td>\dbior</td>
<td>65</td>
</tr>
<tr>
<td>\DeclareMathSymbol</td>
<td>62, 63</td>
</tr>
<tr>
<td>\DeclareRobustCommand</td>
<td>39</td>
</tr>
<tr>
<td>\delimiter</td>
<td>8</td>
</tr>
<tr>
<td>\dimen@</td>
<td>19–22, 24, 50–53, 55, 75–78</td>
</tr>
<tr>
<td>\displaystyle</td>
<td>12</td>
</tr>
<tr>
<td>\hb@xt@</td>
<td>44</td>
</tr>
<tr>
<td>\left</td>
<td>24, 78</td>
</tr>
<tr>
<td>\mathbin</td>
<td>62–66</td>
</tr>
<tr>
<td>\mathcal</td>
<td>49</td>
</tr>
<tr>
<td>\mathfrak</td>
<td>49</td>
</tr>
<tr>
<td>\mathit</td>
<td>49</td>
</tr>
<tr>
<td>\mathbf</td>
<td>49</td>
</tr>
<tr>
<td>\mathbb</td>
<td>49</td>
</tr>
<tr>
<td>Command</td>
<td>Page</td>
</tr>
<tr>
<td>--------------------</td>
<td>------</td>
</tr>
<tr>
<td>\mathclose</td>
<td>69</td>
</tr>
<tr>
<td>\mathopen</td>
<td>68</td>
</tr>
<tr>
<td>\mathord</td>
<td>67</td>
</tr>
<tr>
<td>\mathpalette</td>
<td>9, 46</td>
</tr>
<tr>
<td>\mathrel</td>
<td>66, 70</td>
</tr>
<tr>
<td>\mid</td>
<td>64, 65</td>
</tr>
<tr>
<td>\mkern</td>
<td>54, 56</td>
</tr>
<tr>
<td>\n@space</td>
<td>24, 78</td>
</tr>
<tr>
<td>\newcount</td>
<td>2</td>
</tr>
<tr>
<td>\of</td>
<td>61</td>
</tr>
<tr>
<td>\raise</td>
<td>37, 55</td>
</tr>
<tr>
<td>\right</td>
<td>24, 78</td>
</tr>
<tr>
<td>\scriptscriptstyle</td>
<td>42</td>
</tr>
<tr>
<td>\sq@delim</td>
<td>8, 24</td>
</tr>
<tr>
<td>\sq@sqrt</td>
<td>2, 8</td>
</tr>
<tr>
<td>\sqrt</td>
<td>1, 30</td>
</tr>
<tr>
<td>\sqrt@i</td>
<td>39, 40</td>
</tr>
<tr>
<td>\sqrt@ii</td>
<td>40, 41, 61</td>
</tr>
<tr>
<td>\sqrt@iii</td>
<td>46, 48</td>
</tr>
<tr>
<td>\sqrt@iv</td>
<td>40, 59</td>
</tr>
<tr>
<td>\sqrtdel</td>
<td>9, 39, 60</td>
</tr>
<tr>
<td>\sqrtdel@i</td>
<td>9, 10</td>
</tr>
<tr>
<td>\sqrtsign</td>
<td>39, 60</td>
</tr>
<tr>
<td>\strutbox</td>
<td>75</td>
</tr>
</tbody>
</table>