

User Manual for datatool bundle version 2.31

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The datatool bundle comes with the following documentation:

datatool-user.pdf This document is the main user guide for the datatool bundle.

datatool-code.pdf Advanced users wishing to know more about the inner workings of all the packages provided in the datatool bundle should read “Documented Code for datatool v2.31”

INSTALL Installation instructions.

CHANGES Change log.

README Package summary.

There’s an old adage, “use the right tool for the right job.” A carpenter’s fine chisel is the right tool for delicate carving, but if you try to use it to hack off a tree branch it will take a long time. That doesn’t mean there’s something wrong with the chisel. It just means you’re using the wrong tool for the job.

The datatool bundle is provided to help perform repetitive commands, such as mail merging, but since \TeX is designed as a typesetting language, don’t expect this bundle to perform as efficiently as custom database systems or a dedicated mathematical or scripting language. **If the provided packages take a frustratingly long time to compile your document, use another language to perform your calculations or data manipulation and save the results in a file that can be input into your document.** For large amounts of data that need to be sorted or filtered or joined, consider storing your data in an SQL database and use `datatooltk`^a to import the data, using SQL syntax to filter, sort and otherwise manipulate the values.

^a<http://www.dickimaw-books.com/software/datatooltk/>

This bundle consists of the following packages:

datatool Main package providing database support. Automatically loads datatool-base.

datatool-base Provides the main library code for numerical and string functions.
Automatically loads datatool-fp or datatool-pgfmath depending on package options.

datagidx Package for generating indexes and glossaries. Automatically loads datatool.

databar Package for drawing bar charts. Automatically loads datatool.

datapie Package for drawing pie charts. Automatically loads datatool.

dataplot Package for drawing simple line graphs. Automatically loads datatool.

databib Package for loading a bibliography into a database. Automatically loads datatool.

person Package for referencing people by the appropriate gender pronouns.
Automatically loads datatool.

In addition, there are two mutually exclusive packages `datatool-fp` and `datatool-pgfmath` that provide mathematical related commands that are just wrapper functions for `fp` or `pgfmath` commands. These can be loaded individually without loading `datatool`. For example, the following documents produce the same results, but the first uses the `fp` package and the second uses the `pgfmath` package:

1. Using `fp` macros:

```
\documentclass{article}
\usepackage{datatool-fp}
\begin{document}
1=2: \dtlifnumeq{1}{2}{true}{false}.
\end{document}
```

2. Using `pgfmath` macros:

```
\documentclass{article}
\usepackage{datatool-pgfmath}
\begin{document}
1=2: \dtlifnumeq{1}{2}{true}{false}.
\end{document}
```

Both `fp` and `pgfmath` have some limitations. These limitations will therefore also be present in the various packages provided with `datatool`, according to the underlying package used.

Contents

1	Introduction	2
2	Data Types	4
2.1	Conditionals	5
2.2	ifthen conditionals	16
3	Fixed Point Arithmetic	22
4	Strings	32
5	Comma-Separated Lists	35
6	Databases	41
6.1	Creating a New Database	42
6.2	Loading a Database from an External ASCII File	44
6.3	Displaying the Contents of a Database	49
6.4	Iterating Through a Database	56
6.5	Null Values	71
6.6	Editing Database Rows	75
6.7	Arithmetical Computations on Database Entries	77
6.8	Sorting a Database	82
6.9	Saving a Database to an External File	94
6.10	Deleting or Clearing a Database	95
6.11	Advanced Database Commands	96
6.11.1	Operating on Current Row	100
6.11.2	Advanced Iteration	106
7	Creating an index, glossary or list of acronyms (datagidx package)	112
7.1	Defining Index/Glossary Databases	113
7.2	Locations	114
7.3	Defining Terms	115
7.3.1	Commands to Assist Sorting	118
7.4	Referencing Terms	124
7.4.1	Shortcut Commands	127
7.5	Adding Extra Fields	128
7.6	Acronyms	129
7.6.1	Using Acronyms	130
7.6.2	Unsetting and Resetting Acronyms	131

7.7	Conditionals	132
7.8	Displaying the Index or Glossary	132
7.8.1	Index or Glossary Styles	134
7.8.2	Sorting the Index or Glossary Database	136
7.9	Package Options	137
8	Pie Charts (datapie package)	141
8.1	Pie Chart Variables	146
8.2	Pie Chart Label Formatting	148
8.3	Pie Chart Colours	149
8.4	Adding Extra Commands Before and After the Pie Chart	151
9	Scatter and Line Plots (dataplot package)	153
9.1	Adding Information to the Plot	161
9.2	Global Plot Settings	162
9.2.1	Lengths	162
9.2.2	Counters	163
9.2.3	Macros	164
9.3	Adding to a Plot Stream	166
10	Bar Charts (databar package)	169
10.1	Changing the Appearance of a Bar Chart	172
11	Converting a BIB_TE_X database into a datatool database (databib package)	181
11.1	BIB _T E _X : An Overview	181
11.1.1	BIB _T E _X database	182
11.2	Loading a databib database	184
11.3	Displaying a databib database	185
11.4	Changing the bibliography style	189
11.4.1	Modifying an existing style	189
11.5	Iterating through a databib database	194
11.6	Multiple Bibliographies	197
12	Referencing People (person package)	200
12.1	Defining and undefining People	200
12.2	Displaying Information	201
12.3	Advanced Commands	207
12.3.1	Conditionals	207
12.3.2	Iterating Through Defined People	208
12.3.3	Accessing Individual Information	209
	Bibliography	210
	Acknowledgements	211

List of Examples

1	Displaying the Contents of a Database	51
2	Balance Sheet	55
3	Student scores	57
4	Student Scores—Labelling	60
5	Filtering Rows	60
6	Checking for the First Row (booktabs)	62
7	Breaking Out of a Loop	63
8	Stripy Tables	64
9	Two Database Rows per Tabular Row	64
10	Iterating Through Keys in a Row	65
11	Nested <code>\DTLforeach</code>	68
12	Dynamically Allocating Field Name	70
13	Null vs Empty Values	72
14	Editing Database Rows	76
15	Arithmetical Computations	78
16	Mail Merging	81
17	Sorting a Database—Dealing with Inversions	84
18	Sorting a Database	90
19	Influencing the sort order	92
20	Two Database Rows Per Tabular Row (Column-Wise)	99
21	Joining Two Databases in a Single Table	103
22	Creating an Index	138
23	A Pie Chart	143
24	Separating Segments from the Pie Chart	144
25	Changing the Inner and Outer Labels	147
26	Changing the Inner and Outer Label Format	148
27	Pie Segment Colours	150
28	Adding Information to the Pie Chart	151
29	A Basic Graph	156
30	Plotting Multiple Data Sets	159
31	Adding Information to a Plot	161
32	Adding to a Plot Stream	166
33	Plotting Multiple Keys in the Same Database	167
34	A Basic Bar Chart	171
35	A Labelled Bar Chart	174
36	Profit/Loss Bar Chart	175
37	A Multi-Bar Chart	177

38	Creating a list of publications since a given year	187
39	Creating a list of my 10 most recent publications	189
40	Compact bibliography	192
41	Highlighting a given author	193
42	Separate List of Journals and Conference Papers	196
43	Multiple Bibliographies	198
44	Order of Service (Memorial)	203
45	Order of Service (Baptism)	205
46	Mail Merging Using Appropriate Gender	206

List of Figures

8.1	A pie chart	143
8.2	A pie chart (outer labels set)	144
8.3	A pie chart (rotation enabled)	145
8.4	A pie chart with cutaway segments	145
8.5	A pie chart with cutaway segments (<code>cutaway={1-2}</code>)	146
8.6	A pie chart with cutaway segments (<code>cutaway={1,2}</code>)	147
8.7	A pie chart (changing the labels)	148
8.8	A pie chart (changing the label format)	149
8.9	A pie chart (using segment colours and outline)	151
8.10	An annotated pie chart	152
9.1	A scatter plot	157
9.2	A line plot	158
9.3	A scatter plot (multiple datasets)	160
9.4	A scatter plot (with a legend)	160
9.5	A scatter plot (using the end plot hook to annotate the plot)	162
9.6	Adding to a plot stream	166
9.7	Time to growth data (plotting from the same database using different keys)	168
10.1	A basic bar chart	171
10.2	A bar chart (labelled)	175
10.3	Profits for 2000–2003 (a horizontal bar chart)	177
10.4	Student marks (a multi-bar chart)	179
10.5	Student marks (annotating a bar chart)	180

List of Tables

6.1	Special character mappings used by <code>\DTLloadrawdb</code>	49
6.2	Time to Growth Data	51
6.3	Balance Sheet	55
6.4	Student scores (displaying a database in a table)	58
6.5	Student scores (labelling rows)	61
6.6	Top student scores (filtering rows using <code>\DTLisgt</code>)	61
6.7	Student scores (B) — filtering rows using <code>\DTLisopenbetween</code>	62
6.8	Student scores (booktabs)	63
6.9	First Three Rows	64
6.10	A stripy table (illustrating the use of <code>\DTLifoddrow</code>)	65
6.11	Two database rows per tabular row (illustrating the use of <code>\DTLifoddrow</code>)	65
6.12	Student Scores (Iterating Through Keys)	66
6.13	Student Scores (Using <code>\dtlforeachkey</code> and <code>\DTLforeachkeyinrow</code>)	67
6.14	Student Scores (Filtering Out a Column)	68
6.15	Temperature = 25, NaCl = 4.7, pH = 0.5 (illustrating nested <code>\DTLforeach</code>)	70
6.16	Temperature = 25, NaCl = 4.8, pH = 1.5 (illustrating nested <code>\DTLforeach</code>)	70
6.17	Temperature = 30, NaCl = 5.12, pH = 4.5 (illustrating nested <code>\DTLforeach</code>)	70
6.18	Club Membership	71
6.19	Student marks (with averages)	77
6.20	Student scores (using arithmetic computations)	78
6.21	Student scores (sorted by score)	90
6.22	Student scores (sorted by name)	91
6.23	Student scores (case sensitive sort)	92
6.24	Student scores (case ignored when sorting)	92
6.25	Student scores (influencing the sort order)	93
6.26	Two database rows per tabular row (column-wise)	99
6.27	Student Marks (Joining Databases)	104
6.28	Student Marks (Joining Databases)	105
6.29	Student Marks (Joining Databases)	106

1 Introduction

The datatool bundle consists of the following packages: datatool (which loads datatool-base and either datatool-fp or datatool-pgfmath), datagidx, datapie, dataplot, databar, databib and person.

- The datatool package can be used to:
 - Create or load databases.
 - Sort rows of a database (either numerically or alphabetically, ascending or descending).
 - Perform repetitive operations on each row of a database (e.g. mail merging). Conditions may be imposed to exclude rows.

Package Options:

utf8 Boolean key. May be used to switch off the UTF-8 support described on 85 in Section 6.8. If you both load inputenc with UTF-8 support and you use accent commands like \' or \c then make sure you have at least version 2.05 of mfirstuc if you want to use commands like \makefirstuc.

verbose Boolean key. If true, prints informational messages in transcript.

math May take one of two values: fp (load datatool-fp) or pgfmath (load datatool-pgfmath). Default is: fp.

delimiter Delimiter used in CSV files. Default is a double quote (").

separator Delimiter used in CSV files. Default is a comma (,).

- The datatool-base package can be used to:
 - Determine whether an argument is an integer, a real number, currency or a string. (Scientific notation is currently not supported.) Locale dependent number settings are supported (such as a comma as a decimal character and a full stop as a number group character).
 - Convert locale dependent numbers/currency to the decimal format required by the fp or pgfmath packages, enabling fixed point arithmetic to be performed on elements of the database.
 - Names can be converted to initials.
 - Determine if strings are all upper or lower case.
 - Perform string comparisons (both case sensitive and case insensitive).

Package Options:

verbose Boolean key. If true, prints informational messages in transcript.

math May take one of two values: fp (load datatool-fp) or pgfmath (load datatool-pgfmath). Default is: fp.

- The datagidx package (see [chapter 7](#)) can be used to generate indexes or glossaries as an alternative to packages such as glossaries.
- The datapie package (see [chapter 8](#)) can be used to convert a database into a pie chart:
 - Segments can be separated from the rest of the chart to make them stand out.
 - Colour/grey scale options.
 - Predefined segment colours can be changed.
 - Hooks provided to add extra information to the chart
- The databar package (see [chapter 10](#)) can be used to convert a database into a bar chart:
 - Colour/grey scale options.
 - Predefined bar colours can be changed.
 - Hooks provided to add extra information to the chart

(The datapie and databar packages do not support the creation of 3D charts, and I have no plans to implement them at any later date. The use of 3D charts should be discouraged. They may look pretty, but the purpose of a chart is to be informative. Three dimensional graphics cause distortion, which can result in misleading impressions. The pgf manual provides a more in-depth discussion on the matter.)

- The dataplot package (see [chapter 9](#)) can be used to convert a database into a two dimensional plot using markers and/or lines. Three dimensional plots are currently not supported.
- The databib package (see [chapter 11](#)) can be used to convert a BIB_T_E_X database into a datatool database.
- The person package (see [chapter 12](#)) can be used for gender-specific mail-merging and similar uses to avoid the cumbersome use of the impersonal “he/she”.

2 Data Types

The datatool-base package recognises four data types: integers, real numbers, currency and strings.

Integers An integer is a sequence of digits, optionally groups of three digits may be separated by the number group character. The default number group character is a comma (,) but may be changed using `\DTLsetnumberchars` (see below).

Real Numbers A real number is an integer followed by the decimal character followed by one or more digits. The decimal character is a full stop (.) by default. The number group and decimal characters may be changed using

`\DTLsetnumberchars`

```
\DTLsetnumberchars{\langle number group character \rangle}{\langle decimal character \rangle}
```

Note that scientific notation is not supported, and the number group character may not be used after the decimal character.

Currency A currency symbol followed by an integer or real number is considered to be the currency data type. There are two predefined currency symbols, `\$` and `\pounds`. In addition, if any of the following commands are defined at the start of the document, they are also considered to be a currency symbol: `\texteuro`, `\textdollar`, `\textstirling`, `\textyen`, `\textwon`, `\textcurrency`, `\euro` and `\yen`. Additional currency symbols can be defined using

`\DTLnewcurrencysymbol`

```
\DTLnewcurrencysymbol{\langle symbol \rangle}
```

Strings Anything that doesn't belong to the above three types is considered to be a string.

2.1 Conditionals

The following conditionals are provided by the datatool-base package:

`\DTLifint`

```
\DTLifint{<text>}{<true part>}{<>false part>}
```

If *<text>* is an integer then do *<true part>*, otherwise do *<>false part>*. For example

```
\DTLifint{2536}{integer}{not an integer}
```

produces: integer.

The number group character may appear in the number, for example:

```
\DTLifint{2,536}{integer}{not an integer}
```

produces: integer. However, the number group character may only be followed by a group of three digits. For example:

```
\DTLifint{2,5,3,6}{integer}{not an integer}
```

produces: not an integer. The number group character may be changed. For example:

```
\DTLsetnumberchars{.}{,}%  
\DTLifint{2,536}{integer}{not an integer}
```

this now produces: not an integer, since 2,536 is now a real number.

Note that nothing else can be appended or prepended to the number. For example:

```
\DTLsetnumberchars{,}{.}%  
\DTLifint{2,536m}{integer}{not an integer}
```

produces: not an integer.

`\DTLifreal`

```
\DTLifreal{<text>}{<true part>}{<>false part>}
```

If *<text>* is a real number then do *<true part>*, otherwise do *<>false part>*. For example

```
\DTLifreal{1000.0}{real}{not real}
```

produces: real.

Note that an integer is not considered a real number:

```
\DTLifreal{1,000}{real}{not real}
```

produces: not real.

Whereas

```
\DTLifreal{1,000.0}{real}{not real}
```

produces: real.

However

```
\DTLsetnumberchars{.}{,}%  
\DTLifreal{1,000}{real}{not real}
```

produces: real since the comma is now the decimal character.

Currency is not considered to be real:

```
\DTLsetnumberchars{,}{.}%  
\DTLifreal{\$1.00}{real}{not real}
```

produces: not real.

`\DTLifcurrency`

```
\DTLifcurrency{<text>}{<>true part>}{<>false part>}
```

If *<text>* is currency, then do *<>true part>*, otherwise do false part. For example:

```
\DTLifcurrency{\$5.99}{currency}{not currency}
```

produces: currency. Similarly:

```
\DTLifcurrency{\pounds5.99}{currency}{not currency}
```

produces: currency. Note, however, that

```
\DTLifcurrency{US\$5.99}{currency}{not currency}
```

produces: not currency. If you want this to be considered currency, you will have to add the sequence `US\$` to the set of currency symbols:

```
\DTLnewcurrencysymbol{US\$}%  
\DTLifcurrency{US\$5.99}{currency}{not currency}
```

this now produces: currency.

This document has used the `textcomp` package which defines `\texteuro`, so this is also considered to be currency. For example:

```
\DTLifcurrency{\texteuro5.99}{currency}{not currency}
```

produces: currency.

The preferred method is to display the euro symbol in a sans-serif font, but

```
\DTLifcurrency{\textsf{\texteuro}5.99}{currency}{not currency}
```

will produce: not currency.

It is better to define a new command, for example:

```
\DeclareRobustCommand*\euro{\textsf{\texteuro}}
```

and add that command to the list of currency symbols. In fact, in this case, if you define the command `\euro` in the preamble, it will automatically be added to the list of known currency symbols. If however you define `\euro` in the document, you will have to add it using `\DTLnewcurrencysymbol`. For example:

```
\newcommand*{\euro}{\textsf{\texteuro}}%
\DTLnewcurrencysymbol{\euro}%
\DTLifcurrency{\euro5.99}{currency}{not currency}
```

produces: currency.

`\DTLifcurrencyunit`

```
\DTLifcurrencyunit{<text>}{<symbol>}{<true part>}{<>false part>}
```

If *<text>* is currency, and uses *<symbol>* as the unit of currency, then do *<true part>* otherwise do *<>false part>*. For example:

```
\DTLifcurrencyunit{\$6.99}{\$}{dollars}{not dollars}
```

produces: dollars. Another example:

```
\def\cost{\euro10.50}%
\DTLifcurrencyunit{\cost}{\euro}{euros}{not euros}
```

produces: euros.

`\DTLifnumerical`

```
\DTLifnumerical{<text>}{<true part>}{<>false part>}
```

If *<text>* is numerical (either an integer, real number or currency) then do *<true part>* otherwise do *<>false part>*. For example:

```
\DTLifnumerical{1,000.0}{number}{string}.
```

produces: number. Whereas

```
\DTLsetnumberchars{.}{,}%
\DTLifnumerical{1,000.0}{number}{string}.
```

produces: string. Since the number group character is now a full stop, and the decimal character is now a comma. (The number group character may only appear before the decimal character, not after it.)

Currency is also considered to be numerical:

```
\DTLsetnumberchars{,}{.}%
\DTLifnumerical{\$1,000.0}{number}{string}.
```

produces: number.

`\DTLifstring`

```
\DTLifstring{<text>}{<>true part>}{<>false part>}
```

This is the opposite of `\DTLifnumerical`. If `<text>` is not numerical, do `<>true part>`, otherwise do `<>false part>`.

`\DTLifcasedatatype`

```
\DTLifcasedatatype{<text>}{<string case>}{<int case>}{<real case>}{<currency case>}
```

If `<text>` is a string do `<string case>`, if `<text>` is an integer do `<int case>`, if `<text>` is a real number do `<real case>`, if `<text>` is currency do `<currency case>`. For example:

```
\DTLifcasedatatype{1,000}{string}{integer}{real}{currency}
```

produces: integer.

`\dtlifnumeq`

```
\dtlifnumeq{<num1>}{<num2>}{<>true part>}{<>false part>}
```

If `<num1>` is equal to `<num2>`, then do `<>true part>`, otherwise do `<>false part>` where `<num1>` and `<num2>` are plain numbers using a full stop as the decimal point and no number group separator. For currency or locale dependent numbers use `\DTLifnumeq`.

`\DTLifnumeq`

```
\DTLifnumeq{<num1>}{<num2>}{<>true part>}{<>false part>}
```

If `<num1>` is equal to `<num2>`, then do `<>true part>`, otherwise do `<>false part>`. Note that both `<num1>` and `<num2>` must be numerical (either integers, real numbers or currency). The currency symbol is ignored when determining equality. For example

```
\DTLifnumeq{\pounds10.50}{10.5}{true}{false}
```

produces: true, since they are considered to be numerically equivalent. Likewise:

```
\DTLifnumeq{\pounds10.50}{\$10.50}{true}{false}
```

produces: true.

`\DTLifstringeq`

```
\DTLifstringeq{<string1>}{<string2>}{<true part>}{<false part>}
```

`\DTLifstringeq*`

```
\DTLifstringeq*{<string1>}{<string2>}{<true part>}{<false part>}
```

If *<string1>* and *<string2>* are the same, then do *<true part>*, otherwise do *<false part>*. The starred version ignores the case, the unstarred version is case sensitive. Both *<string1>* and *<string2>* are considered to be strings, so for example:

```
\DTLifstringeq{10.50}{10.5}{true}{false}
```

produces: false.

Note that

```
\DTLifstringeq{Text}{text}{true}{false}
```

produces: false, whereas

```
\DTLifstringeq*{Text}{text}{true}{false}
```

produces: true, however it should also be noted that many commands will be ignored, so:

```
\DTLifstringeq{\uppercase{t}ext}{text}{true}{false}
```

produces: false.

Spaces are considered to be equivalent to `\space` and `~`. For example:

```
\DTLifstringeq{an apple}{an~apple}{true}{false}
```

produces: true. Consecutive spaces are treated as the same, for example:

```
\DTLifstringeq{an apple}{an apple}{true}{false}
```

produces: true.

`\DTLifeq`

```
\DTLifeq{<arg1>}{<arg2>}{<true part>}{<false part>}
```

`\DTLifeq*`

```
\DTLifeq*{<arg1>}{<arg2>}{<true part>}{<false part>}
```

If both *<arg1>* and *<arg2>* are numerical, then this is equivalent to `\DTLifnumeq`, otherwise it is equivalent to `\DTLifstringeq` (when using `\DTLifeq`) or `\DTLifstringeq*` (when using `\DTLifeq*`).

`\dtlifnumlt`

```
\DTLifnumlt{<num1>}{<num2>}{<true part>}{<false part>}
```

If $\langle num1 \rangle$ is less than $\langle num2 \rangle$, then do $\langle true part \rangle$, otherwise do $\langle false part \rangle$ where $\langle num1 \rangle$ and $\langle num2 \rangle$ are plain numbers using a full stop as the decimal point and no number group separator. For currency or locale dependent numbers use `\DTLifnumlt`.

`\DTLifnumlt`

```
\DTLifnumlt{<num1>}{<num2>}{<true part>}{<false part>}
```

If $\langle num1 \rangle$ is less than $\langle num2 \rangle$, then do $\langle true part \rangle$, otherwise do $\langle false part \rangle$. Note that both $\langle num1 \rangle$ and $\langle num2 \rangle$ must be numerical (either integers, real numbers or currency).

`\DTLifstringlt`

```
\DTLifstringlt{<string1>}{<string2>}{<true part>}{<false part>}
```

`\DTLifstringlt*`

```
\DTLifstringlt*{<string1>}{<string2>}{<true part>}{<false part>}
```

If $\langle string1 \rangle$ is alphabetically less than $\langle string2 \rangle$, then do $\langle true part \rangle$, otherwise do $\langle false part \rangle$. The starred version ignores the case, the unstarred version is case sensitive. For example:

```
\DTLifstringlt{aardvark}{zebra}{less}{not less}
```

produces: less.

Note that both $\langle string1 \rangle$ and $\langle string2 \rangle$ are considered to be strings, so for example:

```
\DTLifstringlt{2}{10}{less}{not less}
```

produces: not less, since the string 2 comes after the string 10 when arranged alphabetically.

The case sensitive (unstarred) version considers uppercase characters to be less than lowercase characters, so

```
\DTLifstringlt{B}{a}{less}{not less}
```

produces: less, whereas

```
\DTLifstringlt*{B}{a}{less}{not less}
```

produces: not less.

`\DTLiflt`

```
\DTLiflt{<arg1>}{<arg2>}{<true part>}{<false part>}
```

`\DTLiflt*`

```
\DTLiflt*{<arg1>}{<arg2>}{<true part>}{<false part>}
```

If $\langle arg1 \rangle$ and $\langle arg2 \rangle$ are both numerical, then this is equivalent to `\DTLifnumlt`, otherwise it is equivalent to `\DTLstringlt` (when using `\DTLiflt`) or `\DTLstringlt*` (when using `\DTLiflt*`).

`\DTLifnumgt`

```
\DTLifnumgt{<num1>}{<num2>}{<true part>}{<false part>}
```

If $\langle num1 \rangle$ is greater than $\langle num2 \rangle$, then do $\langle true part \rangle$, otherwise do $\langle false part \rangle$. Note that both $\langle num1 \rangle$ and $\langle num2 \rangle$ must be numerical (either integers, real numbers or currency).

`\DTLifstringgt`

```
\DTLifstringgt{<string1>}{<string2>}{<true part>}{<false part>}
```

`\DTLifstringgt*`

```
\DTLifstringgt*{<string1>}{<string2>}{<true part>}{<false part>}
```

If $\langle string1 \rangle$ is alphabetically greater than $\langle string2 \rangle$, then do $\langle true part \rangle$, otherwise do $\langle false part \rangle$. The starred version ignores the case, the unstarred version is case sensitive. For example:

```
\DTLifstringgt{aardvark}{zebra}{greater}{not greater}
```

produces: not greater.

Note that both $\langle string1 \rangle$ and $\langle string2 \rangle$ are considered to be strings, so for example:

```
\DTLifstringgt{2}{10}{greater}{not greater}
```

produces: greater, since the string 2 comes after the string 10 when arranged alphabetically.

As with `\DTLifstringlt`, uppercase characters are considered to be less than lower case characters when performing a case sensitive comparison so:

```
\DTLifstringgt{B}{a}{greater}{not greater}
```

produces: not greater, whereas

```
\DTLifstringgt*{B}{a}{greater}{not greater}
```

produces: greater.

`\DTLifgt`

```
\DTLifgt{<arg1>}{<arg2>}{<true part>}{<false part>}
```

`\DTLifgt*`

```
\DTLifgt*{<arg1>}{<arg2>}{<true part>}{<false part>}
```

If $\langle arg1 \rangle$ and $\langle arg2 \rangle$ are both numerical, then this is equivalent to `\DTLifnumgt`, otherwise it is equivalent to `\DTLstringgt` (when using `\DTLifgt`) or `\DTLstringgt*` (when using `\DTLifgt*`).

`\DTLifnumclosedbetween`

```
\DTLifnumclosedbetween{<num>}{<min>}{<max>}{<true part>}{<false part>}
```

If $\langle min \rangle \leq \langle num \rangle \leq \langle max \rangle$ then do $\langle true part \rangle$, otherwise do $\langle false part \rangle$. Note that $\langle num \rangle$, $\langle min \rangle$ and $\langle max \rangle$ must be numerical (either integers, real numbers or currency). The currency symbol is ignored when determining equality. For example:

```
\DTLifnumclosedbetween{5.4}{5}{7}{inside}{outside}
```

produces: inside. Note that the closed range includes end points:

```
\DTLifnumclosedbetween{5}{5}{7}{inside}{outside}
```

produces: inside.

`\DTLifstringclosedbetween`

```
\DTLifstringclosedbetween{<string>}{<min>}{<max>}{<true part>}{<false part>}
```

`\DTLifstringclosedbetween*`

```
\DTLifstringclosedbetween*{<string>}{<min>}{<max>}{<true part>}{<false part>}
```

This determines if $\langle string \rangle$ is between $\langle min \rangle$ and $\langle max \rangle$ in the alphabetical sense, or is equal to either $\langle min \rangle$ or $\langle max \rangle$. The starred version ignores the case, the unstarred version is case sensitive.

`\DTLifclosedbetween`

```
\DTLifclosedbetween{<arg>}{<min>}{<max>}{<true part>}{<false part>}
```

`\DTLifclosedbetween*`

```
\DTLifclosedbetween*{<arg>}{<min>}{<max>}{<true part>}{<false part>}
```

If $\langle arg \rangle$, $\langle min \rangle$ and $\langle max \rangle$ are numerical, then this is equivalent to `\DTLifnumclosedbetween`

otherwise it is equivalent to

`\DTLifstringclosedbetween`
(when using `\DTLifclosedbetween`) or
`\DTLifstringclosedbetween*`
(when using `\DTLifclosedbetween*`).

`\DTLifnumopenbetween`

```
\DTLifnumopenbetween{<num>}{<min>}{<max>}{<true part>}{<false part>}
```

If $\langle min \rangle$ $\langle num \rangle$ $\langle max \rangle$ then do $\langle true part \rangle$, otherwise do $\langle false part \rangle$. Note that $\langle num \rangle$, $\langle min \rangle$ and $\langle max \rangle$ must be numerical (either integers, real numbers or currency). Again, the currency symbol is ignored when determining equality. For example:

```
\DTLifnumopenbetween{5.4}{5}{7}{inside}{outside}
```

produces: inside. Note that end points are not included. For example:

```
\DTLifnumopenbetween{5}{5}{7}{inside}{outside}
```

produces: outside.

`\DTLifstringopenbetween`

```
\DTLifstringopenbetween{<string>}{<min>}{<max>}{<true part>}{<false part>}
```

`\DTLifstringopenbetween*`

```
\DTLifstringopenbetween*{<string>}{<min>}{<max>}{<true part>}{<false part>}
```

This determines if $\langle string \rangle$ is between $\langle min \rangle$ and $\langle max \rangle$ in the alphabetical sense. The starred version ignores the case, the unstarred version is case sensitive.

`\DTLifopenbetween`

```
\DTLifopenbetween{<arg>}{<min>}{<max>}{<true part>}{<false part>}
```

`\DTLifopenbetween*`

```
\DTLifopenbetween*{<arg>}{<min>}{<max>}{<true part>}{<false part>}
```

If $\langle arg \rangle$, $\langle min \rangle$ and $\langle max \rangle$ are numerical, then this is equivalent to

`\DTLifnumopenbetween` otherwise it is equivalent to
`\DTLifstringopenbetween` (when using `\DTLifopenbetween`) or
`\DTLifstringopenbetween*` (when using `\DTLifopenbetween*`).

`\DTLifFPclosedbetween`

```
\DTLifFPclosedbetween{<num>}{<min>}{<max>}{<true part>}{<false part>}
```

If $\langle min \rangle \leq \langle num \rangle \leq \langle max \rangle$ then do *<true part>*, otherwise do *<false part>* where $\langle num \rangle$, $\langle min \rangle$ and $\langle max \rangle$ are all in standard fixed point notation (i.e. no number group separator, no currency symbols and a full stop as a decimal point).

`\DTLifFPopenbetween`

```
\DTLifFPopenbetween{<num>}{<min>}{<max>}{<true part>}{<false part>}
```

If $\langle min \rangle < \langle num \rangle < \langle max \rangle$ then do *<true part>*, otherwise do *<false part>* where $\langle num \rangle$, $\langle min \rangle$ and $\langle max \rangle$ are all in standard fixed point notation (i.e. no number group separator, no currency symbols and a full stop as a decimal point).

`\DTLifAllUpperCase`

```
\DTLifAllUpperCase{<string>}{<true part>}{<false part>}
```

Tests if *<string>* is all upper case. For example:

```
\DTLifAllUpperCase{WORD}{all upper}{not all upper}
```

produces: all upper, whereas

```
\DTLifAllUpperCase{Word}{all upper}{not all upper}
```

produces: not all upper. Note also that:

```
\DTLifAllUpperCase{\MakeUppercase{word}}{all upper}{not all upper}
```

also produces: all upper. `\MakeTextUppercase` (defined in David Carlisle's `textcase` package) and `\uppercase` are also detected, otherwise, if a command is encountered, the case of the command is considered. For example:

```
\DTLifAllUpperCase{MAN{\OE}UVRE}{all upper}{not all upper}
```

produces: all upper.

`\DTLifAllLowerCase`

```
\DTLifAllLowerCase{<string>}{<true part>}{<false part>}
```

Tests if *<string>* is all lower case. For example:

```
\DTLifAllLowerCase{word}{all lower}{not all lower}
```

produces: all lower, whereas

```
\DTLifAllLowerCase{Word}{all lower}{not all lower}
```

produces: not all lower. Note also that:

```
\DTLifAllLowerCase{\MakeLowercase{WORD}}{all lower}{not all lower}
```

also produces: all lower. `\MakeTextLowercase` (defined in David Carlisle's `textcase` package) and `\lowercase` are also detected, otherwise, if a command is encountered, the case of the command is considered. For example:

```
\DTLifAllLowerCase{man{\oe}uvre}{all lower}{not all lower}
```

produces: all lower.

`\DTLifSubString`

```
\DTLifSubString{<string>}{<substring>}{<true part>}{<false part>}
```

This tests if `<substring>` is a sub-string of `<string>`. This command performs a case sensitive match. For example:

```
\DTLifSubString{An apple}{app}{is substring}{isn't substring}
```

produces: is substring. Note that spaces are considered to be equivalent to `\space` or `~`, so

```
\DTLifSubString{An apple}{n~a}{is substring}{isn't substring}
```

produces: is substring, but other commands are skipped, so

```
\DTLifSubString{An \uppercase{a}pple}{app}{is substring}{isn't substring}
```

produces: is substring, since the `\uppercase` command is ignored. Note also that grouping is ignored, so:

```
\DTLifSubString{An {ap}ple}{app}{is substring}{isn't substring}
```

produces: is substring.

`\DTLifSubString` is case sensitive, so:

```
\DTLifSubString{An Apple}{app}{is substring}{isn't substring}
```

produces: isn't substring.

`\DTLifStartsWith`

```
\DTLifStartsWith{<string>}{<substring>}{<true part>}{<false part>}
```

This is like `\DTLifSubString`, except that `<substring>` must occur at the start of `<string>`. This command performs a case sensitive match. For example,

```
\DTLifStartsWith{An apple}{app}{prefix}{not a prefix}
```

produces: not a prefix. All the above remarks for `\DTLifSubString` also applies to `\DTLifStartsWith`. For example:

```
\DTLifStartsWith{\uppercase{a}n apple}{an~}{prefix}{not a prefix}
```

produces: not a prefix, since `\uppercase` is ignored, and `~` is considered to be the same as a space, whereas

```
\DTLifStartsWith{An apple}{an~}{prefix}{not a prefix}
```

produces: not a prefix.

2.2 ifthen conditionals

The commands described in the previous section can not be used as the conditional part of the `\ifthenelse` or `\whiledo` commands provided by the `ifthen` package. This section describes analogous commands which may only be used in the conditional argument of `\ifthenelse` and `\whiledo`. These may be used with the boolean operations `\not`, `\and` and `\or` provided by the `ifthen` package. See the `ifthen` documentation for further details.

`\DTLisstring`

```
\DTLisstring{<text>}
```

Tests if `<text>` is a string. For example:

```
\ifthenelse{\DTLisstring{some text}}{string}{not a string}
```

produces: string.

`\DTLisnumerical`

```
\DTLisnumerical{<text>}
```

Tests if `<text>` is numerical (i.e. not a string). For example:

```
\ifthenelse{\DTLisnumerical{\$10.95}}{numerical}{not numerical}
```

produces: numerical.

Note however that `\DTLisnumerical` requires more care than `\DTLifnumerical` when used with some of the other currency symbols. Consider:

```
\DTLifnumerical{\pounds10.95}{numerical}{not numerical}
```

This produces: numerical. However

```
\ifthenelse{\DTLisnumerical{\pounds10.95}}{numerical}{not numerical}
```


produces: not numerical. This is due to the expansion that occurs within `\ifthenelse`. This can be prevented using `\noexpand`, for example:

```
\ifthenelse{\DTLisnumerical{\noexpand\pounds10.95}}{numerical}{not numerical}
```

produces: numerical.

Likewise:

```
\def\cost{\pounds10.95}%  
\ifthenelse{\DTLisnumerical{\noexpand\cost}}{numerical}{not numerical}
```

produces: numerical.

`\DTLiscurrency`

```
\DTLiscurrency{<text>}
```

Tests if `<text>` is currency. For example:

```
\ifthenelse{\DTLiscurrency{\$10.95}}{currency}{not currency}
```

produces: currency.

The same warning given above for `\DTLisnumerical` also applies here.

`\DTLiscurrencyunit`

```
\DTLiscurrencyunit{<text>}{<symbol>}
```

Tests if `<text>` is currency and that currency uses `<symbol>` as the unit of currency. For example:

```
\ifthenelse{\DTLiscurrencyunit{\$6.99}{\$}}{dollars}{not dollars}
```

produces: dollars. Another example:

```
\def\cost{\euro10.50}%  
\ifthenelse{\DTLiscurrencyunit{\noexpand\cost}{\noexpand\euro}}%  
{euros}{not euros}
```

produces: euros. Again note the use of `\noexpand`.

`\DTLisreal`

```
\DTLisreal{<text>}
```

Tests if `<text>` is a fixed point number (again, an integer is not considered to be a fixed point number). For example:

```
\ifthenelse{\DTLisreal{1.5}}{real}{not real}
```

produces: real.

`\DTLisint`

```
\DTLisint{⟨text⟩}
```

Tests if $\langle text \rangle$ is an integer. For example:

```
\ifthenelse{\DTLisint{153}}{integer}{not an integer}
```

produces: integer.

`\DTLislt`

```
\DTLislt{⟨arg1⟩}{⟨arg2⟩}
```

This checks if $\langle arg1 \rangle$ is less than $\langle arg2 \rangle$. As with `\DTLiflt`, if $\langle arg1 \rangle$ and $\langle arg2 \rangle$ are numerical, a numerical comparison is used, otherwise a case sensitive alphabetical comparison is used. (Note that there is no starred version of this command, but you can instead use `\DTLisilt` to ignore the case.)

`\DTLisilt`

```
\DTLisilt{⟨arg1⟩}{⟨arg2⟩}
```

This checks if $\langle arg1 \rangle$ is less than $\langle arg2 \rangle$. As with `\DTLiflt*`, if $\langle arg1 \rangle$ and $\langle arg2 \rangle$ are numerical, a numerical comparison is used, otherwise a case insensitive alphabetical comparison is used.

`\DTLisgt`

```
\DTLisgt{⟨arg1⟩}{⟨arg2⟩}
```

This checks if $\langle arg1 \rangle$ is greater than $\langle arg2 \rangle$. As with `\DTLifgt`, if $\langle arg1 \rangle$ and $\langle arg2 \rangle$ are numerical, a numerical comparison is used, otherwise a case sensitive alphabetical comparison is used. (Note that there is no starred version of this command, instead use `\DTLisigt` to ignore the case.)

`\DTLisigt`

```
\DTLisigt{⟨arg1⟩}{⟨arg2⟩}
```

This checks if $\langle arg1 \rangle$ is greater than $\langle arg2 \rangle$. As with `\DTLifgt*`, if $\langle arg1 \rangle$ and $\langle arg2 \rangle$ are numerical, a numerical comparison is used, otherwise a case insensitive alphabetical comparison is used.

`\DTLiseq`

```
\DTLiseq{⟨arg1⟩}{⟨arg2⟩}
```

This checks if $\langle arg1 \rangle$ is equal to $\langle arg2 \rangle$. As with `\DTLifeq`, if $\langle arg1 \rangle$ and $\langle arg2 \rangle$ are numerical, a numerical comparison is used, otherwise a case sensitive alphabetical comparison is used. (Note that there is no starred version of this command, instead use `\DTLisieq`.)

`\DTLisieq`

```
\DTLisieq{\langle arg1 \rangle}{\langle arg2 \rangle}
```

This checks if $\langle arg1 \rangle$ is equal to $\langle arg2 \rangle$. As with `\DTLifeq*`, if $\langle arg1 \rangle$ and $\langle arg2 \rangle$ are numerical, a numerical comparison is used, otherwise a case insensitive alphabetical comparison is used.

`\DTLisclosedbetween`

```
\DTLisclosedbetween{\langle arg \rangle}{\langle min \rangle}{\langle max \rangle}
```

This checks if $\langle arg \rangle$ lies between $\langle min \rangle$ and $\langle max \rangle$ (end points included). As with `\DTLifclosedbetween`, if the arguments are numerical, a numerical comparison is used, otherwise a case sensitive alphabetical comparison is used. (Note that there is no starred version of this command, instead use `\DTLisiclosedbetween`.)

`\DTLisiclosedbetween`

```
\DTLisiclosedbetween{\langle arg \rangle}{\langle min \rangle}{\langle max \rangle}
```

This checks if $\langle arg \rangle$ lies between $\langle min \rangle$ and $\langle max \rangle$ (end points included). As with `\DTLifclosedbetween*`, if the arguments are numerical, a numerical comparison is used, otherwise a case insensitive alphabetical comparison is used.

`\DTLisopenbetween`

```
\DTLisopenbetween{\langle arg \rangle}{\langle min \rangle}{\langle max \rangle}
```

This checks if $\langle arg \rangle$ lies between $\langle min \rangle$ and $\langle max \rangle$ (end points excluded). As with `\DTLifopenbetween`, if the arguments are numerical, a numerical comparison is used, otherwise a case sensitive alphabetical comparison is used. (Note that there is no starred version of this command, instead use `\DTLisiopenbetween`.)

`\DTLisiopenbetween`

```
\DTLisiopenbetween{\langle arg \rangle}{\langle min \rangle}{\langle max \rangle}
```

This checks if $\langle arg \rangle$ lies between $\langle min \rangle$ and $\langle max \rangle$ (end points excluded). As with `\DTLifopenbetween*`, if the arguments are numerical, a numerical comparison is used, otherwise a case insensitive alphabetical comparison is used.

`\DTLisFP1t`

```
\DTLisFPlt{⟨num1⟩}{⟨num2⟩}
```

This checks if $\langle num1 \rangle$ is less than $\langle num2 \rangle$, where both numbers are in standard fixed point format (i.e. no number group separators, no currency and a full stop as a decimal point).

```
\DTLisFPlteq
```

```
\DTLisFPlteq{⟨num1⟩}{⟨num2⟩}
```

This checks if $\langle num1 \rangle$ is less than or equal to $\langle num2 \rangle$, where both numbers are in standard fixed point format (i.e. no number group separators, no currency and a full stop as a decimal point).

```
\DTLisFPgt
```

```
\DTLisFPgt{⟨num1⟩}{⟨num2⟩}
```

This checks if $\langle num1 \rangle$ is greater than $\langle num2 \rangle$, where both numbers are in standard fixed point format (i.e. no number group separators, no currency and a full stop as a decimal point).

```
\DTLisFPgteq
```

```
\DTLisFPgteq{⟨num1⟩}{⟨num2⟩}
```

This checks if $\langle num1 \rangle$ is greater than or equal to $\langle num2 \rangle$, where both numbers are in standard fixed point format (i.e. no number group separators, no currency and a full stop as a decimal point).

```
\DTLisFPeq
```

```
\DTLisFPeq{⟨num1⟩}{⟨num2⟩}
```

This checks if $\langle num1 \rangle$ is equal to $\langle num2 \rangle$, where both numbers are in standard fixed point format (i.e. no number group separators, no currency and a full stop as a decimal point).

```
\DTLisFPclosedbetween
```

```
\DTLisFPclosedbetween{⟨num⟩}{⟨min⟩}{⟨max⟩}
```

This checks if $\langle num \rangle$ lies between $\langle min \rangle$ and $\langle max \rangle$ (end points included). All arguments must be numbers in standard fixed point format (i.e. no number group separators, no currency and a full stop as a decimal point).

```
\DTLisFPopenbetween
```

```
\DTLisFPopenbetween{⟨num⟩}{⟨min⟩}{⟨max⟩}
```

This checks if $\langle num \rangle$ lies between $\langle min \rangle$ and $\langle max \rangle$ (end points excluded). All arguments must be numbers in standard fixed point format (i.e. no number group separators, no currency and a full stop as a decimal point).

`\DTLisSubString`

```
\DTLisSubString{ $\langle string \rangle$ }{ $\langle substring \rangle$ }
```

This checks if $\langle substring \rangle$ is contained in $\langle string \rangle$. The remarks about `\DTLifSubString` also apply to `\DTLisSubString`. This command performs a case sensitive match.

`\DTLisPrefix`

```
\DTLisPrefix{ $\langle string \rangle$ }{ $\langle prefix \rangle$ }
```

This checks if $\langle string \rangle$ starts with $\langle prefix \rangle$. The remarks about `\DTLifStartsWith` also apply to `\DTLisPrefix`. This command performs a case sensitive match.

`\DTLisinlist`

```
\DTLisinlist{ $\langle element \rangle$ }{ $\langle list \rangle$ }
```

This checks if $\langle element \rangle$ is in $\langle list \rangle$. (Internally uses `\DTLifinlist`.)

3 Fixed Point Arithmetic

The datatool bundle doesn't support scientific notation.

The datatool-base package uses either the `fp` or the `pgfmath` package to perform fixed point arithmetic, however all numbers must be converted from the locale dependent format into the format required by the `fp` or `pgfmath` packages. A numerical value (i.e. an integer, a real or currency) can be converted into a plain decimal number using

`\DTLconverttodecimal`

```
\DTLconverttodecimal{⟨num⟩}{⟨cmd⟩}
```

The decimal number will be stored in `⟨cmd⟩` which must be a control sequence. For example:

```
\DTLconverttodecimal{1,563.54}{\mynum}
```

will define `\mynum` to be `1563.54`. The command `\mynum` can then be used in any of the arithmetic macros provided by the `fp` or `pgfmath` packages.

The arguments to `\DTLconverttodecimal` don't get fully expanded so, for example,

```
\def\myval{1.23}
\DTLconverttodecimal{\myval}{\mynum}
```

will work, but the following *won't* work:

```
\def\myval{1.23}
\def\myotherval{\myval}
\DTLconverttodecimal{\myotherval}{\mynum}
```

Nor will the following work:

```
\def\myval{9}
\DTLconverttodecimal{\myval 9}{\mynum}
```

There are two commands provided to perform the reverse:

`\DTLdecimaltolocale`

```
\DTLdecimaltolocale{⟨number⟩}{⟨cmd⟩}
```

This converts a plain decimal number $\langle number \rangle$ (that uses a full stop as the decimal character and has no number group characters) into a locale dependent format. The resulting number is stored in $\langle cmd \rangle$, which must be a control sequence. For example:

```
\DTLdecimaltolocale{6795.3}{\mynum}
```

will define $\backslash mynum$ to be 6,795.3.

```
\DTLdecimaltocurrency
```

```
\DTLdecimaltocurrency{\langle number \rangle}{\langle cmd \rangle}
```

This will convert a plain decimal number $\langle number \rangle$ into a locale dependent currency format. For example:

```
\DTLdecimaltocurrency{267.5}{\price}\price
```

will produce: £267.50.

The currency symbol used by $\backslash DTLdecimaltocurrency$ is initially $\backslash \$$, but it will use the currency last encountered. So, for example

```
\DTLifcurrency{\texteuro45.00}{}{}%  
\DTLdecimaltocurrency{267.5}{\price}\price
```

will produce: €267.50. This is because the last currency symbol to be encountered was $\backslash texteuro$. You can reset the currency symbol using the command:

```
\DTLsetdefaultcurrency
```

```
\DTLsetdefaultcurrency{\langle symbol \rangle}
```

For example:

```
\DTLsetdefaultcurrency{\textyen}%  
\DTLdecimaltocurrency{267.5}{\price}\price
```

will produce: ¥267.50

The `datatool-base` package provides convenience commands which use $\backslash DTLconverttodecimal$, and then use the basic macros provided by the `fp/pgfmath` package. The resulting value is then converted back into the locale format using $\backslash DTLdecimaltolocale$ or $\backslash DTLdecimaltocurrency$. Note that since these commands use $\backslash DTLconverttodecimal$ the caveat above regarding expansion also applies to all the commands.

If you don't require currency or locale conversion, you can reduce the package overheads by using the commands defined in the `datatool-fp` or `datatool-pgfmath` packages which provide interface commands to `fp` or `pgfmath`, respectively. (See sections 2 and 3 of the documented code, `datatool-code.pdf`.) Alternatively, you can just use the `fp` or `pgfmath` commands explicitly. (See the `fp` or `pgfmath` manuals for further details.)

`\DTLadd`

```
\DTLadd{<cmd>}{<num1>}{<num2>}
```

`\DTLgadd`

```
\DTLgadd{<cmd>}{<num1>}{<num2>}
```

This sets the control sequence `<cmd>` to `<num1>+<num2>`. `\DTLadd` sets `<cmd>` locally, while `\DTLgadd` sets `<cmd>` globally.

For example:

```
\DTLadd{\result}{3,562.65}{412.2}\result
```

will produce: 3,974.850000000. Since `\DTLconverttodecimal` can convert currency to a real number, you can also add prices. For example:

```
\DTLadd{\result}{\pounds3,562.65}{\pounds452.2}\result
```

produces: £4,014.850000000.

Note that `datatool` isn't aware of exchange rates! If you use different currency symbols, the last symbol will be used. For example

```
\DTLadd{\result}{\pounds3,562.65}{\euro452.2}\result
```

produces: €4,014.850000000.

Likewise, if one value is a number and the other is a currency, the type of the last value, `<num2>`, will be used for the result. For example:

```
\DTLadd{\result}{3,562.65}{\$452.2}\result
```

produces: \$4,014.850000000.

`\DTLaddall`

```
\DTLaddall{<cmd>}{<number list>}
```

`\DTLgaddall`

```
\DTLgaddall{<cmd>}{<number list>}
```

This sets the control sequence `<cmd>` to the sum of all the numbers in `<number list>`.

`\DTLaddall` sets `<cmd>` locally, while `\DTLgaddall` sets `<cmd>` globally. Example:

```
\DTLaddall{\total}{25.1,45.2,35.6}\total
```

produces: 105.900000000. Note that if any of the numbers in `<number list>` contain a comma, you must group the number. Example:

```
\DTLaddall{\total}{{1,525},{2,340},500}\total
```


produces: 4,365.

`\DTLsub`

```
\DTLsub{<cmd>}{<num1>}{<num2>}
```

`\DTLgsub`

```
\DTLgsub{<cmd>}{<num1>}{<num2>}
```

This sets the control sequence `<cmd>` to `<num1>-<num2>`. `\DTLsub` sets `<cmd>` locally, while `\DTLgsub` sets `<cmd>` globally.

For example:

```
\DTLsub{\result}{3,562.65}{412.2}\result
```

will produce: 3,150.450000000. As with `\DTLadd`, `<num1>` and `<num2>` may be currency.

`\DTLmul`

```
\DTLmul{<cmd>}{<num1>}{<num2>}
```

`\DTLgmul`

```
\DTLgmul{<cmd>}{<num1>}{<num2>}
```

This sets the control sequence `<cmd>` to `<num1>×<num2>`. `\DTLmul` sets `<cmd>` locally, while `\DTLgmul` sets `<cmd>` globally.

For example:

```
\DTLmul{\result}{568.95}{2}\result
```

will produce: 1,137.900000000. Again, `<num1>` or `<num2>` may be currency, but unlike `\DTLadd` and `\DTLsub`, currency overrides integer/real. For example:

```
\DTLmul{\result}{\pounds568.95}{2}\result
```

will produce: £1,137.900000000. Likewise,

```
\DTLmul{\result}{2}{\pounds568.95}\result
```

will produce: £1,137.900000000. Although it doesn't make sense to multiply two currencies, `datatool` will allow

```
\DTLmul{\result}{\$2}{\pounds568.95}\result
```

which will produce: £1,137.900000000.

`\DTLdiv`

```
\DTLdiv{<cmd>}{<num1>}{<num2>}
```

\DTLgdiv

```
\DTLgdiv{<cmd>}{<num1>}{<num2>}
```

This sets the control sequence $\langle cmd \rangle$ to $\langle num1 \rangle \div \langle num2 \rangle$. `\DLTdiv` sets $\langle cmd \rangle$ locally, while `\DTLgdiv` sets $\langle cmd \rangle$ globally.

For example:

```
\DTLdiv{\result}{501}{2}\result
```

will produce: 250.500000000. Again, $\langle num1 \rangle$ or $\langle num2 \rangle$ may be currency, but the resulting type will not be a currency if both $\langle num1 \rangle$ and $\langle num2 \rangle$ use the same currency symbol. For example:

```
\DTLdiv{\result}{\$501}{\$2}\result
```

will produce: 250.500000000. Whereas

```
\DTLdiv{\result}{\$501}{2}\result
```

will produce: \$250.500000000.

\DTLabs

```
\DTLabs{<cmd>}{<num>}
```

\DTLgabs

```
\DTLgabs{<cmd>}{<num>}
```

This sets $\langle cmd \rangle$ to the absolute value of $\langle num \rangle$. `\DLTabs` sets $\langle cmd \rangle$ locally, while `\DTLgabs` sets $\langle cmd \rangle$ globally. Example:

```
\DTLabs{\result}{-\pounds2.50}\result
```

produces: £2.500000000.

\DTLneg

```
\DTLneg{<cmd>}{<num>}
```

\DTLgneg

```
\DTLgneg{<cmd>}{<num>}
```

This sets $\langle cmd \rangle$ to the negative of $\langle num \rangle$. `\DLTneg` sets $\langle cmd \rangle$ locally, while `\DTLgneg` sets $\langle cmd \rangle$ globally. Example:

```
\DTLneg{\result}{\pounds2.50}\result
```

produces: -£2.500000000.

`\DTLsqrt`

```
\DTLsqrt{<cmd>}{<num>}
```

`\DTLgsqrt`

```
\DTLgsqrt{<cmd>}{<num>}
```

This sets `<cmd>` to the sqrt root of `<num>`. `\DTLsqrt` sets `<cmd>` locally, while `\DTLgsqrt` sets `<cmd>` globally. Example:

```
\DTLsqrt{\result}{2}\result
```

produces: 1.414213562.

`\DTLmin`

```
\DTLmin{<cmd>}{<num1>}{<num2>}
```

`\DTLgmin`

```
\DTLgmin{<cmd>}{<num1>}{<num2>}
```

This sets the control sequence `<cmd>` to the minimum of `<num1>` and `<num2>`. `\DTLmin` sets `<cmd>` locally, while `\DTLgmin` sets `<cmd>` globally. For example:

```
\DTLmin{\result}{256}{32}\result
```

produces: 32. Again, `<num1>` and `<num2>` may be currency. For example:

```
\DTLmin{\result}{256}{\pounds32}\result
```

produces: £32, whereas

```
\DTLmin{\result}{\pounds256}{32}\result
```

produces: 32. As mentioned above, datatool doesn't know about exchange rates, so be careful about mixing currencies. For example:

```
\DTLmin{\result}{\pounds5}{\$6}\result
```

produces: £5, which may not necessarily be true!

`\DTLminall`

```
\DTLminall{<cmd>}{<number list>}
```

`\DTLgminall`

```
\DTLgminall{<cmd>}{<number list>}
```

This sets the control sequence $\langle cmd \rangle$ to the minimum of all the numbers in $\langle number list \rangle$. `\DLTminall` sets $\langle cmd \rangle$ locally, while `\DTLgminall` sets $\langle cmd \rangle$ globally.

Example:

```
\DTLminall{\theMin}{25.1, 45.2, 35.6}\theMin
```

produces: 25.1. Note that if any of the numbers in $\langle number list \rangle$ contain a comma, you must group the number. Example:

```
\DTLminall{\theMin}{{1, 525}, {2, 340}, 500}\theMin
```

produces: 500.

`\DTLmax`

```
\DTLmax{\langle cmd \rangle}{\langle num1 \rangle}{\langle num2 \rangle}
```

`\DTLgmax`

```
\DTLgmax{\langle cmd \rangle}{\langle num1 \rangle}{\langle num2 \rangle}
```

This sets the control sequence $\langle cmd \rangle$ to the maximum of $\langle num1 \rangle$ and $\langle num2 \rangle$. `\DLTmax` sets $\langle cmd \rangle$ locally, while `\DTLgmax` sets $\langle cmd \rangle$ globally. For example:

```
\DTLmax{\result}{256}{32}\result
```

produces: 256. Again, $\langle num1 \rangle$ and $\langle num2 \rangle$ may be currency, but the same warnings for `\DTLmin` apply.

`\DTLmaxall`

```
\DTLmaxall{\langle cmd \rangle}{\langle number list \rangle}
```

`\DTLgmaxall`

```
\DTLgmaxall{\langle cmd \rangle}{\langle number list \rangle}
```

This sets the control sequence $\langle cmd \rangle$ to the maximum of all the numbers in $\langle number list \rangle$. `\DLTmaxall` sets $\langle cmd \rangle$ locally, while `\DTLgmaxall` sets $\langle cmd \rangle$ globally.

Example:

```
\DTLmaxall{\theMax}{25.1, 45.2, 35.6}\theMax
```

produces: 45.2. Note that if any of the numbers in $\langle number list \rangle$ contain a comma, you must group the number. Example:

```
\DTLmaxall{\theMax}{{1, 525}, {2, 340}, 500}\theMax
```

produces: 2,340.

`\DTLmeanforall`

```
\DTLmeanforall{<cmd>}{<number list>}
```

`\DTLgmeanall`

```
\DTLgmeanforall{<cmd>}{<number list>}
```

This sets the control sequence `<cmd>` to the arithmetic mean of all the numbers in `<number list>`. `\DTLmeanforall` sets `<cmd>` locally, while `\DTLgmeanforall` sets `<cmd>` globally. Example:

```
\DTLmeanforall{\theMean}{25.1,45.2,35.6}\theMean
```

produces: 35.30000000. Note that if any of the numbers in `<number list>` contain a comma, you must group the number. Example:

```
\DTLmeanforall{\theMean}{{1,525},{2,340},500}\theMean
```

produces: 1,455.

`\DTLvarianceforall`

```
\DTLvarianceforall{<cmd>}{<number list>}
```

`\DTLgvarianceforall`

```
\DTLgvarianceforall{<cmd>}{<number list>}
```

This sets the control sequence `<cmd>` to the variance of all the numbers in `<number list>`. `\DTLvarianceforall` sets `<cmd>` locally, while `\DTLgvarianceforall` sets `<cmd>` globally. Example:

```
\DTLvarianceforall{\theVar}{25.1,45.2,35.6}\theVar
```

produces: 67.38000000. Again note that if any of the numbers in `<number list>` contain a comma, you must group the number.

`\DTLsdfforall`

```
\DTLsdfforall{<cmd>}{<number list>}
```

`\DTLgstdforall`

```
\DTLgstdforall{<cmd>}{<number list>}
```

This sets the control sequence `<cmd>` to the standard deviation of all the numbers in `<number list>`. `\DTLstdforall` sets `<cmd>` locally, while `\DTLgstdforall` sets `<cmd>` globally. Example:

```
\DTLstdforall{\theSD}{25.1,45.2,35.6}\theSD
```

produces: 8.208532146. Note that if any of the numbers in `<number list>` contain a comma, you must group the number. Example:

```
\DTLstdforall{\theSD}{{1,525},{2,340},500}\theSD
```

produces: 752.805862534.

`\DTLround`

```
\DTLround{<cmd>}{<num>}{<num digits>}
```

`\DTLground`

```
\DTLground{<cmd>}{<num>}{<num digits>}
```

This sets `<cmd>` to `<num>` rounded to `<num digits>` after the decimal character.

`\DTLround` sets `<cmd>` locally, while `\DTLground` sets `<cmd>` globally. Example:

```
\DTLround{\result}{3.135276}{2}\result
```

produces: 3.14.

`\DTLtrunc`

```
\DTLtrunc{<cmd>}{<num>}{<num digits>}
```

`\DTLgtrunc`

```
\DTLgtrunc{<cmd>}{<num>}{<num digits>}
```

This sets `<cmd>` to `<num>` truncated to `<num digits>` after the decimal character.

`\DTLtrunc` sets `<cmd>` locally, while `\DTLgtrunc` sets `<cmd>` globally. Example:

```
\DTLtrunc{\result}{3.135276}{2}\result
```

produces: 3.13.

`\DTLclip`

```
\DTLclip{cmd}{num}
```

`\DTLgclip`

```
\DTLgclip{cmd}{num}
```

This sets *cmd* to *num* with all unnecessary 0's removed. `\DTLclip` sets *cmd* locally, while `\DTLgclip` sets *cmd* globally.

4 Strings

Strings are considered to be anything non-numerical. The `datatool` package loads the `substr` package, so you can use the commands defined in that package to determine if one string is contained in another string. In addition, the `datatool` provides the following macros:

`\DTLsubstitute`

```
\DTLsubstitute{<cmd>}{<original>}{<replacement>}
```

This replaces the first occurrence of `<original>` in `<cmd>` with `<replacement>`. Note that `<cmd>` must be the name of a command. For example:

```
\def\mystr{abcdce}\DTLsubstitute{\mystr}{c}{z}\mystr
```

produces: abzdce.

`\DTLsubstituteall`

```
\DTLsubstituteall{<cmd>}{<original>}{<replacement>}
```

This replaces all occurrences of `<original>` in `<cmd>` with `<replacement>`, where again, `<cmd>` must be the name of a command. For example:

```
\def\mystr{abcdce}\DTLsubstituteall{\mystr}{c}{z}\mystr
```

produces: abzdze.

`\DTLsplitstring`

```
\DTLsplitstring{<string>}{<split text>}{<before cmd>}{<after cmd>}
```

This splits `<string>` at the first occurrence of `<split text>` and stores the before part in the command `<before cmd>` and the after part in the command `<after cmd>`. For example:

```
\DTLsplitstring{abcdce}{c}{\beforepart}{\afterpart}%  
Before part: ``\beforepart''. After part: ``\afterpart''
```

produces: Before part: "ab". After part: "dce". Note that for `\DTLsplitstring`, `<string>` is not expanded, so

```
\def\mystr{abcdce}%  
\DTLsplitstring{\mystr}{c}{\beforepart}{\afterpart}%  
Before part: ``\beforepart''. After part: ``\afterpart''
```


produces: Before part: "abcdce". After part: "". If you want the string expanded, you will need to use `\expandafter`:

```
\def\mystr{abcdce}%  
\expandafter\DTLsplitstring\expandafter  
{\mystr}{c}{\beforepart}{\afterpart}%  
Before part: ``\beforepart''. After part: ``\afterpart''
```

which produces: Before part: "ab". After part: "dce".

`\DTLinitials`

```
\DTLinitials{<string>}
```

This converts `<string>` (typically a name) into initials. For example:

```
\DTLinitials{Mary Ann}
```

produces: M.A. (including the final full stop). Note that

```
\DTLinitials{Mary-Ann}
```

produces: M.-A. (including the final full stop). Be careful if the initial letter has an accent. The accented letter needs to be placed in a group, if you want the initial to also have an accent, otherwise the accent command will be ignored. For example:

```
\DTLinitials{{\'}E}lise Adams}
```

produces: É.A., whereas

```
\DTLinitials{\'Elise Adams}
```

produces: E.A. In fact, any command which appears at the start of the name that is not enclosed in a group will be ignored. For example:

```
\DTLinitials{\MakeUppercase{m}ary ann}
```

produces: m.a., whereas

```
\DTLinitials{{\MakeUppercase{m}}ary ann}
```

produces: M.a., but note that

```
\DTLinitials{\MakeUppercase{mary ann}}
```

produces: mary ann.

`\DTLstoreinitials`

```
\DTLstoreinitials{<string>}{<cmd>}
```

This converts `<string>` into initials and stores the result in `<cmd>` which must be a command name. The remarks about `\DTLinitials` also relate to `\DTLstoreinitials`. For example

```
\DTLstoreinitials{Marie-{\'}E}lise del~Rosario}{\theInitials}\theInitials
```

produces: M.-É.d.R.

Both the above commands rely on the following to format the initials:

`\DTLafterinitials`

```
\DTLafterinitials
```

This indicates what to do at the end of the initials. This simply does a full stop by default.

`\DTLbetweeninitials`

```
\DTLbetweeninitials
```

This indicates what to do between initials. This does a full stop by default.

`\DTLinitialhyphen`

```
\DTLinitialhyphen
```

This indicates what to do at a hyphen. This simply does a hyphen by default, but can be redefined to do nothing to prevent the hyphen appearing in the initials.

`\DTLafterinitialbeforehyphen`

```
\DTLafterinitialbeforehyphen
```

This indicates what to do between an initial and a hyphen. This simply does a full stop by default.

For example

```
\renewcommand*\DTLafterinitialbeforehyphen{}%  
\DTLinitials{Marie-{\ 'E}lise del~Rosario}
```

produces: M-É.d.R. whereas

```
\renewcommand*\DTLafterinitialbeforehyphen{}%  
\renewcommand*\DTLafterinitials{}%  
\renewcommand*\DTLbetweeninitials{}%  
\renewcommand*\DTLinitialhyphen{}%  
\DTLinitials{Marie-{\ 'E}lise del~Rosario}
```

produces: MÉdR

5 Comma-Separated Lists

The datatool-base package automatically loads the etoolbox package, so you can use any of the list commands provided by that package, or you can use the internal command `\@for` provided by the L^AT_EX kernel (and modified by the xfor package, which is also loaded by datatool-base).

In addition to those commands, datatool-base provides some commands that deal with comma-separated lists. Note that this just refers to a control sequence that stores a list of elements separated by commas, for example:

```
\newcommand{\mylist}{elephant, ant, zebra, duck}
```

This isn't the same as comma-separated files, which is dealt with in Section 6.

`\DTLformatlist`

```
\DTLformatlist{⟨list⟩}
```

Formats the comma-separated list. The unstarred version scopes the internal operation. The starred form doesn't. The `⟨list⟩` may either be an explicit comma-separated list or a control sequence whose replacement text is a comma-separated list. If the list contains empty elements then `\DTLformatlist` will either include or skip the empty element according to the conditional:

`\ifDTLlistskipempty`

```
\ifDTLlistskipempty
```

For example:

```
\newcommand{\mylist}{elephant,, ant, zebra, duck}%  
\DTLlistskipemptytrue  
\DTLformatlist{\mylist}\par  
\DTLlistskipemptyfalse  
\DTLformatlist{\mylist}
```

which produces:

```
elephant, ant, zebra & duck  
elephant,, ant, zebra & duck
```

The default setting is

```
\DTLlistskipemptytrue
```

Note that this may cause a difference when upgrading to v2.31 as in previous versions `\DTLformatlist` didn't skip empty elements. To restore the original behaviour use:

```
\DTLlistskipemptyfalse
```

before `\DTLformatlist`.

The list formatting command inserts

```
\DTLlistformatsep
```

```
\DTLlistformatsep
```

between each item, except for the last pair which uses:

```
\DTLlistformatlastsep
```

```
\DTLlistformatlastsep
```

if there are only two items in the list or

```
\DTLlistformatoxford
```

```
\DTLlistformatoxford\DTLlistformatlastsep
```

if there are three or more items in the list. `\DTLlistformatlastsep` uses

```
\DTLlandname
```

```
\DTLlandname
```

Each item in the list is formatted according to

```
\DTLlistformatitem
```

```
\DTLlistformatitem{<item>}
```

The default definitions are:

- `\DTLlistformatitem{<item>}`: just does `<item>`;
- `\DTLlistformatsep`: `,_` (comma followed by a space);
- `\DTLlandname`: if `\andname` is defined this is defined as `\andname` otherwise it's defined as `\&`;
- `\DTLlistformatlastsep`: does `_ \DTLlandname \space`;
- `\DTLlistformatoxford`: does nothing (so if you want an Oxford comma you need to redefine this).

For example

```
\renewcommand{\DTLlistformatitem}[1]{\emph{#1}}%
```

```

\renewcommand{\DTLlistformatoxford}{,}%
\renewcommand{\DTLlandname}{and}%
One: \DTLformatlist{elephant}.

Two: \DTLformatlist{elephant,ant}.

Three: \DTLformatlist{elephant,ant,zebra}.

Four: \DTLformatlist{elephant,ant,zebra,duck}.

```

produces:

One: *elephant*.
Two: *elephant and ant*.
Three: *elephant, ant, and zebra*.
Four: *elephant, ant, zebra, and duck*.

You can test if an element is contained in a comma-separated list using:

`\DTLifinlist`

```
\DTLifinlist{<element>}{<list>}{<true part>}{<false part>}
```

If *<element>* is contained in the comma-separated list given by *<list>*, then this does *<true part>* otherwise it does false part. (Does a one level expansion on *<list>*, but no expansion on *<element>*.)

`\DTLnumitemsinlist`

```
\DTLnumitemsinlist{<list>}{<cmd>}
```

Counts the number of elements in *<list>* and stores the result in *<cmd>*, which must be a control sequence. As from v2.31, this obeys the conditional `\ifDTLlistskipempty` to determine if empty elements should be skipped. For example:

```

\newcommand{\mylist}{foo,,bar,baz,wibble}
Number of non-empty elements:
\DTLnumitemsinlist{\mylist}{\listnum}\listnum.\par
\DTLlistskipemptyfalse
Number of elements (including empty):
\DTLnumitemsinlist{\mylist}{\listnum}\listnum.

```

This produces:

Number of non-empty elements: 4.
Number of elements (including empty): 5.

`\DTLlistelement`

```
\DTLlistelement{\langle list \rangle}{\langle index \rangle}
```

Does the $\langle index \rangle$ th element of the list (starting at 1 for the first element) or generates a warning if the index is out of range. This obeys the conditional `\ifDTLlistskipempty` to determine if empty elements should be skipped. For example:

```
\newcommand{\mylist}{foo,,bar,baz,wibble}
3rd item in list (skip empty): \DTLlistelement{\mylist}{3}.\par
\ifDTLlistskipempty
3rd item in list (include empty): \DTLlistelement{\mylist}{3}.
```

This produces:

```
3rd item in list (skip empty): baz.
3rd item in list (include empty): baz.
```

```
\DTLfetchlistelement
```

```
\DTLfetchlistelement{\langle list \rangle}{\langle index \rangle}{\langle cs \rangle}
```

Like `\DTLlistelement` but it stores the $\langle index \rangle$ th element in the command given by $\langle cs \rangle$.

```
\dtlsortlist
```

```
\dtlsortlist{\langle list cs \rangle}{\langle criteria cs \rangle}
```

This sorts the comma-separated list stored in the command $\langle list cs \rangle$ according to the criteria command $\langle criteria cs \rangle$. The criteria command must take three arguments: a count register in which to store the result, element $\langle A \rangle$ and element $\langle B \rangle$. If $\langle A \rangle$ is considered less than $\langle B \rangle$, the count register should be set to -1 , if $\langle A \rangle$ and $\langle B \rangle$ are considered the same then the count register should be set to 0 , and if $\langle A \rangle$ is considered greater than $\langle B \rangle$, then the count register should be set to 1 .

It's inefficient to use \TeX to sort and comparisons are only made according to the character codes and so are inappropriate for extended Latin or non-Latin alphabets. It's better to use an external tool where possible.

The `datatool`-base package provides some predefined criteria commands:

```
\dtlcompare
```

```
\dtlcompare{\langle register \rangle}{\langle A \rangle}{\langle B \rangle}
```

A case-sensitive comparison.

`\dtlcompare`

```
\dtlcompare{<register>}{<A>}{<B>}
```

A case-insensitive comparison.

`\dtlwordindexcompare`

```
\dtlwordindexcompare{<register>}{<A>}{<B>}
```

English word-ordering comparison for indexes, as described by the Oxford Style Manual.

`\dtlletterindexcompare`

```
\dtlletterindexcompare{<register>}{<A>}{<B>}
```

English letter-ordering comparison for indexes. Those last two commands are described in more detail in Section 6.8.

For example:

```
\newcommand{\mylist}{elephant, ant, zebra, duck}  
\dtlsortlist{\mylist}{\dtlcompare}
```

`\mylist.`

produces:

ant,duck,elephant,zebra.

If you are building up a list, you may prefer to use:

`\dtlinsertinto`

```
\dtlinsertinto{<element>}{<list cs>}{<criteria cs>}
```

which inserts `<element>` into the list stored in the command `<list cs>` according to the criteria command `<criteria cs>`. This is more efficient than first building the list and then sorting it.

For example:

```
\newcommand{\mylist}{}  
\dtlinsertinto{elephant}{\mylist}{\dtlcompare}  
\dtlinsertinto{ant}{\mylist}{\dtlcompare}  
\dtlinsertinto{zebra}{\mylist}{\dtlcompare}  
\dtlinsertinto{duck}{\mylist}{\dtlcompare}
```

`\mylist.`

produces:

ant,duck,elephant,zebra.

Note that `\dtlinsertinto` doesn't expand $\langle element \rangle$. If the element is stored in a command, you need to expand it first. For example:

```
\newcommand*\element{ant}  
\expandafter\dtlinsertinto\expandafter{\element}{\mylist}{\dtlcompare}
```

To ensure that the element is first fully expanded, you can use:

`\edtinsertinto`

```
\edtinsertinto{\langle element \rangle}{\langle list cs \rangle}{\langle criteria cs \rangle}
```

This will fully expand $\langle element \rangle$ using `\protected@edef` and then use `\dtlinsertinto`.

6 Databases

The datatool package provides a means of creating and loading databases. Once a database has been created (or loaded), it is possible to iterate through each row of data, to make it easier to perform repetitive actions, such as mail merging.

Whilst \TeX is an excellent typesetting language, it is not designed as a database management system, and attempting to use it as such is like trying to fasten a screw with a knife instead of a screwdriver: it can be done, but requires great care and is more time consuming. Version 2.0 of the datatool package uses a completely different method of storing the data to previous versions.^a As a result, the code is much more efficient, however, large databases and complex operations will still slow the time taken to process your document. Therefore, if you can, it is better to do the complex operations using whatever system created the data in the first place.

^aMany thanks to Morten Høgholm for providing the new code.

Some advanced commands for accessing database information are described in [section 6.11](#), but using \TeX is nowhere near as efficient as, say, using a SQL database, so don't expect too much from this package.

I've written a Java helper application to accompany datatool called `datatooltk`. The installer is available on CTAN at <http://mirrors.ctan.org/support/datatooltk/datatooltk-installer.jar>. The application will allow you to edit files saved using `\DTLsaverawdb` or `\DTLprotectedsaverawdb` in a graphical interface or import data from a SQL database, a CSV file or a `probsoln` dataset.

Each database has the data stored internally in a token register and the header information is stored in an internal control sequence. In general you don't need to worry about the way it's stored, except that row indexes start from 1 (the first row of data) and column indexes also start from 1. Columns may be referenced by a label but rows can only be referenced by the row index. Once the internal commands and registers have been set, datatool doesn't keep a record of how or where the information came from (such as a CSV file or through a file created by `datatooltk`). Changes to the data only modify the internal commands and are lost at the end of the \LaTeX run unless you save the data.

6.1 Creating a New Database

`\DTLnewdb`

```
\DTLnewdb{<db name>}
```

`\DTLgnewdb`

```
\DTLgnewdb{<db name>}
```

This command creates a new empty database called *<db name>*. The second form is for global definitions. You can test if a database is empty using:

`\DTLifdbempty`

```
\DTLifdbempty{<db name>}{<>true part>}{<>false part>}
```

If the database called *<db name>* is empty, do *<>true part>*, otherwise do *<>false part>*.

`\DTLrowcount`

```
\DTLrowcount{<db name>}
```

This command displays the number of rows in the database called *<db name>*.

`\DTLcolumncount`

```
\DTLcolumncount{<db name>}
```

This command displays the number of columns (or keys) in the database called *<db name>*.

`\DTLnewrow`

```
\DTLnewrow{<db name>}
```

This command starts a new row in the database called *<db name>*. This new row becomes the current row when adding new entries.

For example, the following creates an empty database called `mydata`:

```
\DTLnewdb{mydata}
```

The following tests if the database is empty:

```
\DTLifdbempty{mydata}{empty}{not empty}!
```

This produces: `empty!`

The following adds an empty row to the database, this is the first row of the database:

```
\DTLnewrow{mydata}
```

Note that even though the only row in the database is currently empty, the database is no longer considered to be empty:

```
\DTLifdbempty{mydata}{empty}{not empty}!
```

This now produces: not empty! The row count is given by

```
\DTLrowcount{mydata}
```

which produces: 1. The column count is given by

```
\DTLcolumncount{mydata}
```

which produces: 0.

`\DTLnewbentry`

```
\DTLnewbentry{<db name>}{<key>}{<value>}
```

This creates a new entry with the identifier `<key>` whose value is `<value>` and adds it to the last row of the database called `<db name>`. For example:

```
\DTLnewbentry{mydata}{Surname}{Smith}
\DTLnewbentry{mydata}{FirstName}{John}
```

Adds an entry with identifier `Surname` and value `Smith` to the last row of the database named `mydata`, and then adds an entry with identifier `FirstName` and value `John`. Note that the key should not contain any fragile commands. It is generally best to only use non-active characters in the key.

The value isn't expanded by default, but you can change this using the declaration:

`\dtlexpandnewvalue`

```
\dtlexpandnewvalue
```

This can be localised by placing it in a group, or you can switch back using:

`\dtlnoexpandnewvalue`

```
\dtlnoexpandnewvalue
```



Note that database entries can't contain paragraph breaks as many of the macros used by `datatool` are short commands. If you do need a paragraph break in an entry, you can instead use the command:

`\DTLpar`

```
\DTLpar
```

For example:

```
\DTLnewbentry{mydata}{Description}{First paragraph.\DTLpar
Second paragraph.}
```

`\DTLaddentryforrow`

```
\DTLaddentryforrow{<db>}{<assign list>}{<condition>}{<key>}{<value>}
```

This adds the entry with the key given by `<key>` and value given by `<value>` to the first row in the database `<db>` which satisfies the condition given by `<condition>`. The `<assign list>` argument is the same as for `\DTLforeach` (described in [section 6.4](#)) and may be used to set the values which are to be tested in `<condition>` (where, again, `<condition>` is the same as for `\DTLforeach`). For example:

```
\DTLaddentryforrow{mydata}{\firstname=FirstName,\surname=Surname}%  
{\DTLiseq{\firstname}{John}\and\DTLiseq{\surname}{Smith}}%  
{Score}{75}
```

Note that unlike `\DTLnewdbentry`, the value is always expanded when adding an entry using `\DTLaddentryforrow`.

`\DTLsetheader`

```
\DTLsetheader{<db>}{<key>}{<header>}
```

This assigns a header for a given key in the database named `<db>`. This is used by `\DTLdisplaydb` and `\DTLdisplaylongdb` in the header row (see [section 6.3](#)). If you don't assign a header, the header will be given by the key. For example:

```
\DTLsetheader{mydata}{Price}{Price (\$)}
```

`\DTLaddcolumn`

```
\DTLaddcolumn{<db>}{<key>}
```

Adds a new column with the given key to the database `<db>`. This doesn't add any data to the column, just identifies it as an available column. The starred version doesn't check if the database exists.

6.2 Loading a Database from an External ASCII File

`\DTLloaddb` and `\DTLloadrawdb`, described in this section, can't parse files that have newline characters within entries. The `datatooltk` application (see [page 41](#)) can parse them, so if you have multilined entries in a CSV file, you can convert it to `datatool`'s internal database format using `datatooltk` and the input it using `\input` or `\DTLloaddbtex`. See the `datatooltk` documentation for further details.

Remember that row numbers in datatool refer to the row index of the internal data not to line numbers in the CSV file.

Instead of using the commands described in [section 6.1](#) to create a new database, you can load a database from an external ASCII file using:

`\DTLloaddb`

```
\DTLloaddb[<options>]{<db name>}{<filename>}
```

Make sure your document uses the same encoding as *<filename>*. For example, if *<filename>* is UTF-8, then include the following in your document:

```
\usepackage[utf8]{inputenc}
```

By default, `\DTLloaddb` creates a new database called *<db name>* before it loads the data given in the file *<filename>*. If you want to append the data, use

```
\DTLnewdbonloadfalse
```

before you use `\DTLloaddb`. You can reverse this using

```
\DTLnewdbonloadtrue
```

The file (*<filename>*) may have a header row at the start of the file, which provides the *<key>* when creating a new database entry using `\DTLnewdbentry`. The optional argument *<options>* is a *<key>=<value>* list of options.

Some of the keys may take a comma-separated list as a value. Note that spaces count in the default \TeX way within these lists. Remember that \TeX considers an end-of-line character as a space. If you have a long list, consider using the comment character (%) to suppress unwanted space caused by line breaks in the code.

Available options are:

noheader This is a boolean value and indicates if the file does not contain a header. If no value is supplied, `true` is assumed (i.e. the file doesn't contain a header row). If this option is omitted, it is assumed that the file contains a header row.

keys This is a comma-separated list of keys to use, where the keys are listed in the same order as the columns. If the file has a header, these keys will override the values given in the header row. If the file has no header row and no keys are supplied in *<options>*, then the keys will be given by `\dtldefaultkey<n>`, where *<n>* is the column number and `\dtldefaultkey` defaults to "Column".

`\dtldefaultkey`

Note that the list of keys must be delimited by braces since they contain commas. For example:

```
\DTLloaddb[noheader,keys={Temperature,Time,T2G}]{data}{data.csv}
```

autokeys This is a boolean option that will automatically assign default keys (`\dtldefaultkey<n>`, as above) for all columns, regardless of whether the file has a header row. If true, this option overrides the keys option. You may want to use this if you have a header row with many fields containing active characters but you only want to use commands like `\DTLdisplaydb`. (In which case, you may want to consider using `\DTLloaddrawdb` to load the data.)

headers This is a comma-separated list of headers. If not supplied, the header will be the same as that given in the header row, or the key if there is no header row. Note that the list of headers must be delimited by braces since they contain commas. For example:

```
\DTLloaddb[noheader,keys={Temperature,Time,T2G},%
headers={\shortstack{Incubation\\Temperature},%
\shortstack{Incubation\\Time},%
\shortstack{Time to\\Growth}}]{data}{data.csv}
```

omitlines This should be a non-negative integer that specifies how many rows to skip at the start of the file.

By default, the entries in the database must be separated by a comma, and optionally delimited by the double quote character ("). The separator can be changed to a tab separator using the command:

```
\DTLsettabseparator
```

```
\DTLsettabseparator
```

Note that this command changes the category code of the tab character to 12 (other). If, after you have loaded your data, you want to reset the tab category code to 10 (space), you can use:

```
\DTLmaketabspace
```

```
\DTLmaketabspace
```

Don't use this command before you load any tab-separated data.

To set the separator to a character other than a tab, you need to use

```
\DTLsetseparator
```

```
\DTLsetseparator{<character>}
```

The delimiter can be changed using

`\DTLsetdelimiter`

```
\DTLsetdelimiter{\character}
```

Note that spaces count in the usual \TeX manner and won't be trimmed from either side of the separators.

For example, suppose you have a file called `mydata.csv` which contains the following:

```
FirstName, Surname, Score
John, "Smith, Jr", 68
Jane, Brown, 75
Andy, Brown, 42
Z\oe, Adams, 52
```

then

```
\DTLloaddb{mydata}{mydata.csv}
```

is equivalent to:

```
\DTLnewdb{mydata}
\DTLnewrow{mydata}%
\DTLnewdbentry{mydata}{FirstName}{John}%
\DTLnewdbentry{mydata}{Surname}{Smith, Jr}%
\DTLnewdbentry{mydata}{Score}{68}%
\DTLnewrow{mydata}%
\DTLnewdbentry{mydata}{FirstName}{Jane}%
\DTLnewdbentry{mydata}{Surname}{Brown}%
\DTLnewdbentry{mydata}{Score}{75}%
\DTLnewrow{mydata}%
\DTLnewdbentry{mydata}{FirstName}{Andy}%
\DTLnewdbentry{mydata}{Surname}{Brown}%
\DTLnewdbentry{mydata}{Score}{42}%
\DTLnewrow{mydata}%
\DTLnewdbentry{mydata}{FirstName}{Z\oe}%
\DTLnewdbentry{mydata}{Score}{52}%
\DTLnewdbentry{mydata}{Surname}{Adams}%
```

Note that the entry `Smith, Jr` had to be delimited in `mydata.csv` using the double quote character since it contained a comma which is used as the separator. The percent symbol `%` can be used as a comment character within the file.

The file used in the above example contained a \LaTeX command, namely `\`. When using `\DTLloaddb` all the special characters that appear in the command retain their \LaTeX meaning when the file is loaded. It is likely however that the data file may have been created by another application that is not \TeX -aware, such as a spreadsheet

application. For example, suppose you have a file called, say, `products.csv` which looks like:

```
Product, Cost
Fruit & Veg, $1.25
Stationary, $0.80
```

This file contains two of TeX's special characters, namely `&` and `$`. In this case, if you try to load the file using `\DTLloaddb`, you will encounter errors. Instead you can use:

`\DTLloaddrawdb`

```
\DTLloaddrawdb[<options>]{<db name>}{<filename>}
```

This is similar to `\DTLloaddb` except that it maps nine of the ten special characters onto commands which produce that symbol. The only character that retains its active state is the backslash character, so you will still need to check the file for backslash characters. The mappings used are listed in [Table 6.1](#). So using the file `products.csv`, as described above,

```
\DTLloaddrawdb{mydata}{products.csv}
```

is equivalent to:

```
\DTLnewdb{mydata}
\DTLnewrow{mydata}%
\DTLnewdbentry{mydata}{Product}{Fruit \& Veg}%
\DTLnewdbentry{mydata}{Cost}{\$1.25}%
\DTLnewrow{mydata}%
\DTLnewdbentry{mydata}{Product}{Stationary}%
\DTLnewdbentry{mydata}{Cost}{\$0.80}%
```

As with `\DTLloaddb`, you can govern whether or not a new database should be created with `\DTLnewdbonloadtrue` and `\DTLnewdbonloadfalse`.

Note that `\DTLloaddrawdb` is not recommended for CSV files that contain commands. Any active characters occurring within the file must be mapped. The mapping is done through expansion. Version 2.28 now uses `\xdef` rather than `\protected@xdef`, but `\DTLloaddrawdb` isn't intended for files containing L^AT_EX code, but rather for files generated by a non-TeX aware method that doesn't guard against L^AT_EX special characters.

If you have UTF-8 data, it's best to use an engine that natively supports Unicode. Remember that there's no point using `\DTLloaddrawdb` (instead of `\DTLloaddb`) if your file doesn't contain any special characters that require mapping. It's less efficient to load if each row has to be converted, particularly for large files.

It may be that there are other characters that require mapping. For example, the file `products.csv` may instead look like:

```
Product, Cost
```


Table 6.1: Special character mappings used by `\DTLloadrawdb` (note that the backslash retains its active state)

Character	Mapping
%	<code>\%</code>
\$	<code>\\$</code>
&	<code>\&</code>
#	<code>\#</code>
_	<code>_</code>
{	<code>\{</code>
}	<code>\}</code>
~	<code>\textasciitilde</code>
^	<code>\textasciicircum</code>

```
Fruit & Veg, £1.25
Stationary, £0.80
```

The pound character is not an internationally standard keyboard character, and does not generally achieve the desired effect when used in a \LaTeX document. It may therefore be necessary to convert this symbol to an appropriate control sequence. This can be done using the command:

`\DTLrawmap`

```
\DTLrawmap{<string>}{<replacement>}
```

For example:

```
\DTLrawmap{£}{\pounds}
```

will replace all occurrences¹ of `£` with `\pounds`. Naturally, the mappings must be set *prior* to loading the data with `\DTLloadrawdb`.

Note that the warning in the previous section about no paragraph breaks in an entry also applies to entries loaded from a database. If you do need a paragraph break, use `\DTLpar` instead of `\par`, but remember that each row of data in an external data file must not have a line break.

6.3 Displaying the Contents of a Database

Once you have created a database, either loading it from an external file, as described in [section 6.2](#), or using the commands described in [section 6.1](#), you can display the

¹when it is loaded into the \LaTeX database, it does not modify the data file!

entire database in a tabular or longtable environment.

`\DTLdisplaydb`

```
\DTLdisplaydb[<omit list>]{<db>}
```

This displays the database given by *<db>* in a tabular environment. The first row displays the headers for the database in bold, the subsequent rows display the values for each key in each row of the database. The optional argument *<omit list>* is a comma-separated list of column keys to omit. (All columns displayed by default.)

`\DTLdisplaylongdb`

```
\DTLdisplaylongdb[<options>]{<db>}
```

This is like `\DTLdisplaydb` except that it uses the longtable environment instead of the tabular environment. Note that if you use this command, you must load the longtable package, as it is not loaded by datatool. The optional argument *<options>* is a comma-separated list of key=value pairs. The following keys are available:

caption The caption for the longtable.

contcaption The continuation caption.

shortcaption The caption to be used in the list of tables.

label The label for this table.

omit Comma-separated list of column keys to omit.

foot The longtable's foot.

lastfoot The foot for the last page of the longtable.

For example, suppose I have a database called `iris`, then I can display the contents in a longtable using:

```
\DTLdisplaylongdb[%  
caption={Iris Data},%  
label={tab:iris},%  
contcaption={Iris Data (continued)},%  
foot={\em Continued overleaf},%  
lastfoot={}%  
{iris}
```

I can then reference the table using `\ref{tab:iris}`.

See the longtable documentation for details on how to change the longtable settings, such as how to change the table so that it is left aligned instead of centred on the page.

Note that if you want more control over the way the data is displayed, for example, you want to filter rows or columns, you will need to use `\DTLforeach`, described in [section 6.4](#).

Example 1 (Displaying the Contents of a Database)

Suppose I have a file called `t2g.csv` that contains the following:

```
40,120,40
40,90,60
35,180,20
55,190,40
```

This represents time to growth data, where the first column is the incubation temperature, the second column is the incubation time and the third column is the time to growth. This file has no header row, so when it is loaded, the `noheaders` option is required. Note that `\DTLdisplaydb` only puts the data in a tabular environment, so `\DTLdisplaydb` needs to be put in a table environment with a caption to make it a float.

First load the data base, setting the keys and headers:

```
\DTLloaddb[noheader,%
keys={Temperature,Time,T2G},%
headers={\shortstack{Incubation\\Temperature},%
\shortstack{Incubation\\Time},\shortstack{Time to\\Growth}}%
]{t2g}{t2g.csv}
```

Now display the data in a table:

```
\begin{table}[htbp]
\caption{Time to Growth Data}
\centering
\DTLdisplaydb{t2g}
\end{table}
```

The result is shown in [Table 6.2](#).

Table 6.2: Time to Growth Data

Incubation Temperature	Incubation Time	Time to Growth
40	120	40
40	90	60
35	180	20
55	190	40

Each column in the database has an associated data type which indicates what type of data is in that column. This may be one of: string, integer, real number or currency. If a column contains more than one type, the data type is determined as follows:

- If the column contains at least one string, then the column data type is string.

- If the column doesn't contain a string, but contains at least one currency, then the column data type is currency.
- If the column contains only real numbers and integers, the column data type is real number.
- The column data type is integer if the column only contains integers.

The column data type is updated whenever a new entry is added to the database. Note that the column data type is not adjusted when an entry is removed from the database.

The column alignments used by `\DTLdisplaydb` are given by:

`\dtlstringalign`

`\dtlstringalign`

The string alignment defaults to `l` (left aligned).

`\dtlintalign`

`\dtlintalign`

The integer alignment defaults to `r` (right aligned).

`\dtlrealalign`

`\dtlrealalign`

The alignment for real numbers defaults to `r` (right aligned).

`\dtlcurrencyalign`

`\dtlcurrencyalign`

The currency alignment defaults to `r` (right aligned).

You can redefine these to change the column alignments. For example, if you want columns containing strings to have the alignment `p{2in}`, then you can redefine `\dtlstringalign` as follows:

```
\renewcommand{\dtlstringalign}{p{2in}}
```

You can't use siunitx's `S` column alignment with either `\DTLdisplaydb` or `\DTLdisplaylongdb`. Instead, you will need to use `\DTLforeach`. The siunitx documentation provides an example.

In addition to the `\dtl<type>align` commands above, you can also modify the tabular column styles by redefining the following three commands:

`\dtlbeforecols`

```
\dtlbeforecols
```

(before the first column)

```
\dtlbetweencols
```

```
\dtlbetweencols
```

(between each column) and

```
\dtlaftercols
```

```
\dtlaftercols
```

(after the last column).

For example, to place a vertical line before the start of the first column and after the last column, do:

```
\renewcommand{\dtlbeforecols}{|}|
\renewcommand{\dtlaftercols}{|}|
```

If you additionally want vertical lines between columns, do:

```
\renewcommand{\dtlbetweencols}{|}|
```

Limited modifications can be made to the way the data is displayed with `\DTLdisplaydb` and `\DTLdisplaylongdb`. The commands controlling the formatting are described below. If a more complicated layout is required, you will need to use `\DTLforeach` described in [section 6.4](#).

```
\dtlheaderformat
```

```
\dtlheaderformat{<header>}
```

This indicates how to format a column header, where the header is given by *<header>*. This defaults to `\null\hfil\textbf{<header>}\hfil\null`.

```
\dtlstringformat
```

```
\dtlstringformat{<text>}
```

This specifies how to format each entry in the columns that contain strings. This defaults to just displaying *<text>*.

```
\dtlintformat
```

```
\dtlintformat{<text>}
```

This specifies how to format each entry in the columns that contain only integers. This defaults to just displaying *<text>*.

```
\dtlrealformat
```

```
\dtlrealformat{<text>}
```

This specifies how to format each entry in the columns that contain only real numbers or a mixture of real numbers and integers. This defaults to just displaying *<text>*.

```
\dtlcurrencyformat
```

```
\dtlcurrencyformat{<text>}
```

This specifies how to format each entry in the columns that contain only currency or currency mixed with real numbers and/or integers. This defaults to just displaying *<text>*.

```
\dtldisplayvalign
```

```
\dtldisplayvalign
```

Specifies the vertical alignment of the tabular environment used by `\DTLdisplaydb`. Defaults to `c` (centred). May be redefined to `t` (top) or `b` (bottom).

```
\dtldisplaycr
```

```
\dtldisplaycr
```

Specifies how to separate rows. Defaults to just `\tabularnewline`.

```
\dtldisplaystarttab
```

```
\dtldisplaystarttab
```

This is a hook to add something at the beginning of the tabular environment. This defaults to nothing. In the case of `\DTLdisplaylongdb`, this hook is done before the header row on each page of the longtable.

```
\dtldisplayendtab
```

```
\dtldisplayendtab
```

This is a hook to add something at the end of the tabular environment. This defaults to nothing. In the case of `\DTLdisplaylongdb`, this hook is only done on the *last* page of the longtable. You have to use the `foot` option to specify some code to do at the end of each page.

```
\dtldisplayafterhead
```

```
\dtldisplayafterhead
```

This is a hook to add something after the header row, before the first row of data. This defaults to nothing. In the case of `\DTLdisplaylongdb`, this hook is done after the header row on each page of the longtable.

`\dtldisplaystartrow`

```
\dtldisplaystartrow
```

This is a hook to add something at the start of each row, but not including the header row or the first row of data. This defaults to nothing.

If you want to use the `booktabs` package, you can redefine the above three commands to use `\toprule`, `\midrule` and `\bottomrule`:

```
\renewcommand{\dtldisplaystarttab}{\toprule}
\renewcommand{\dtldisplayafterhead}{\midrule}
\renewcommand{\dtldisplayendtab}{\bottomrule}
```

Example 2 (Balance Sheet)

Suppose you have a file called `balance.csv` that contains the following:

```
Description,In,Out,Balance
Travel expenses,,230,-230
Conference fees,,400,-630
Grant,700,,70
Train fare,,70,0
```

The data can be loaded using:

```
\DTLloaddb[headers={Description,In (\pounds),Out (\pounds),Balance
(\pounds)}]{balance}{balance.csv}
```

Suppose I want negative numbers to be displayed in red. I can do this by redefining `\dtlrealformat` to check if the entry is negative. For example:

```
\begin{table}[htbp]
\caption{Balance Sheet}
\renewcommand*{\dtlrealformat}[1]{\DTLiflt{#1}{0}{\color{red}}{#1}}
\centering
\DTLdisplaydb{balance}
\end{table}
```

This produces [Table 6.3](#).

Table 6.3: Balance Sheet

Description	In (£)	Out (£)	Balance (£)
Travel expenses		230.00	-230.00
Conference fees		400.00	-630.00
Grant	700.00		70.00
Train Fare		70.00	0.00

6.4 Iterating Through a Database

Once you have created a database, either loading it from an external file, as described in [section 6.2](#), or using the commands described in [section 6.1](#), you can then iterate through each row of the database and access elements in that row.

The `\DTLforeach` command is provided as a convenient way of iterating through databases with the option to filter rows, cross-reference rows or have nested loops, but for large databases it can be *extremely slow*, especially if the unstarred version is used. If you have a large database, consider pre-processing the data using an external script. See also [Section 6.11.2](#).

`\DTLforeach`

```
\DTLforeach[ $\langle condition \rangle$ ]{ $\langle db name \rangle$ }{ $\langle assign list \rangle$ }{ $\langle text \rangle$ }
```

`\DTLforeach*`

```
\DTLforeach* [ $\langle condition \rangle$ ]{ $\langle db name \rangle$ }{ $\langle assign list \rangle$ }{ $\langle text \rangle$ }
```

This will iterate through each row of the database called $\langle db name \rangle$, applying $\langle text \rangle$ to each row of the database where $\langle condition \rangle$ is met. The argument $\langle assign list \rangle$ is a comma separated list of $\langle cmd \rangle = \langle key \rangle$ pairs. At the start of each row, each command $\langle cmd \rangle$ in $\langle assign list \rangle$ will be set to the value of the entry given by $\langle key \rangle$. These commands may then be used in $\langle text \rangle$.

Note that this assignment is done globally to ensure that `\DTLforeach` works correctly in a tabular environment. Since you may want to use the same set of commands in a later `\DTLforeach`, the commands are not checked to determine if they already exist. It is therefore important that you check you are not using an existing command whose value should not be changed.

The optional argument $\langle condition \rangle$ is a condition in the form allowed by `\ifthenelse`. This includes the commands provided by the `ifthen` package (such as `\not`, `\and`, `\or`), as well as the commands described in [section 2.2](#). The default value of $\langle condition \rangle$ is `\boolean{true}`.

The starred version `\DTLforeach*` is a read-only version. If you want to modify the database using any of the commands described in [section 6.6](#), you must use the unstarred version. The starred version is faster.

As is generally the case with command arguments, verbatim (for example, using `\verb` or the verbatim environment) can't be used in any of the arguments of `\DTLforeach`, specifically verbatim can't be used in $\langle text \rangle$.

There are also environment alternatives:

DTLenvforeach

```
\begin{DTLenvforeach}[\langle condition \rangle]{\langle db name \rangle}{\langle assign list \rangle}
```

DTLenvforeach*

```
\begin{DTLenvforeach*}[\langle condition \rangle]{\langle db name \rangle}{\langle assign list \rangle}
```

However, note that since these environments gather the contents of their body, they also suffer from the above limitation.

Verbatim can't be used in the body of DTLenvforeach or DTLenvforeach*.

Example 3 (Student scores)

Suppose you have a data file called `studentscores.csv` that contains the following:

```
FirstName, Surname, StudentNo, Score
John, "Smith, Jr", 102689, 68
Jane, Brown, 102647, 75
Andy, Brown, 103569, 42
Z\ "oe, Adams, 105987, 52
Roger, Brady, 106872, 58
Clare, Verdon, 104356, 45
```

and you load the data into a database called `scores` using:

```
\DTLloaddb{scores}{studentscores.csv}
```

you can then display the database in a table as follows:

```
\begin{table}[htbp]
\caption{Student scores}
\centering
\begin{tabular}{llr}
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%)
\DTLforeach{scores}{%
\firstname=FirstName, \surname=Surname, \score=Score}{%
\\% start new row
\firstname & \surname & \score}
\end{tabular}
\end{table}
```

This produces [Table 6.4](#). (Note that since I didn't need the student registration number, I didn't bother to assign a command to the key `StudentNo.`)

Note that the new row command `\\` has been placed at the start of the final argument in the above example. This is necessary as placing it at the end of the argument will cause an unwanted row at the end of the table. This is a feature of the loop mechanism.

Table 6.4: Student scores

First Name	Surname	Score (%)
John	Smith, Jr	68
Jane	Brown	75
Andy	Brown	42
Zöe	Adams	52
Roger	Brady	58
Clare	Verdon	45

The macro `\DTLforeach` may be nested up to three times. Each level uses the corresponding counters: `DTLrowi`, `DTLrowii` and `DTLrowiii` which keep track of the current row.

`DTLrowi`
`DTLrowii`
`DTLrowiii`

Note that these counters are only incremented when *condition* is satisfied, therefore they will not have the correct value in *condition*. These counters are incremented using `\refstepcounter` before the start of *text*, so they may be referenced using `\label`, however remember that `\label` references the last counter to be incremented using `\refstepcounter` in the current scope. The `\label` should therefore be the first command in *text* to ensure that it references the current row counter.

`\DTLcurrentindex`

`\DTLcurrentindex`

At the start of each iteration in `\DTLforeach`, `\DTLcurrentindex` is set to the arabic value of the current row counter. Note that this is only set after the condition is tested, so it should only be used in the body of `\DTLforeach` not in the condition. It is also only set locally, so if you use it in a tabular environment, it can only be used before the first instance of `\\` or `&` in the current iteration.

Within the body of `\DTLforeach` (i.e. within *text*) the following conditionals may be used:

`\DTLiffirstrow`

```
\DTLiffirstrow{<true part>}{<false part>}
```

If the current row is the first row, then do *<true part>*, otherwise do *<false part>*.

`\DTLiflastrow`

```
\DTLiflastrow{<true part>}{<false part>}
```

If the current row is the last row, then do *<true part>*, otherwise do *<false part>*.

`\DTLifoddrrow`

```
\DTLifoddrrow{<true part>}{<false part>}
```

If the current row number is an odd number, then do *<true part>*, otherwise do *<false part>*.

`\DTLsavecount`

```
\DTLsavecount{<cmd>}
```

This command will store the value of the row counter used in the last occurrence of `\DTLforeach` in the control sequence *<cmd>*.

`\DTLforeachkeyinrow`

```
\DTLforeachkeyinrow{<cmd>}{<text>}
```

This iterates through each key in the current row, (globally) assigns *<cmd>* to the value of that key, and does *<text>* (*<cmd>* must be a control sequence and may be used in *<text>*). This command may only be used in the body of `\DTLforeach`. At each iteration, `\DTLforeachkeyinrow` sets `\dtlkey` to the current key, `\dtlcol` to the current column index, `\dtltype` to the data type for the current column, and `\dtlheader` to the header for the current column. Note that `\dtltype` corresponds to the column type but if the entries in the column have mixed types, it may not correspond to the type of the current entry.

`\dtlbreak`

```
\dtlbreak
```

You can break out of most of the loops provided by `datatool` using `\dtlbreak`. Note, however, that it doesn't break the loop until the end of the current iteration. There is no provision for a `next` or `continue` style command.

Additional loop commands provided by `datatool` are described in the documented code ([datatool-code.pdf](#)).

Example 4 (Student Scores—Labelling)

In the previous example, the student scores, stored in the database `scores` were placed in a table. In this example the table will be modified slightly to number each student according to the row. Suppose I also want to identify which row Jane Brown is in, and reference it in the text. The easiest way to do this is to construct a label on each row which uniquely identifies that student. The label can't simply be constructed from the surname, as there are two students with the same surname. In order to create a unique label, I can either construct a label from both the surname and the first name, or I can use the student's registration number, or I can use the student's score, since all the scores are unique. The former method will cause a problem since one of the names (Zöe) contains an accent command. Although the registration numbers are all unique, they are not particularly memorable, so I shall instead use the scores.

```
\begin{table}[htbp]
\caption{Student scores}
\centering
\begin{tabular}{c|l|l|l}
\bfseries Row &
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%)%
\DTLforeach*{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\label{row:\score}\theDTLrowi &
\firstname & \surname & \score}%
\end{tabular}
\end{table}
```

Jane Brown scored the highest (75\%), her score can be seen on row~\ref{row:75}.

This produces **Table 6.5** and the following text: Jane Brown scored the highest (75%), her score can be seen on row 2.

Notes:

- the `\label` command is placed before `\the` to ensure that it is in the same scope as the command `\refstepcounter{DTLrowi}`.
- To avoid unwanted spaces the end of line characters are commented out with the percent (%) symbol.

Example 5 (Filtering Rows)

As mentioned earlier, the optional argument *<condition>* of `\DTLforeach` provides a means to exclude certain rows. This example uses the database defined in **example 3**,

Table 6.5: Student scores

Row	First Name	Surname	Score (%)
1	John	Smith, Jr	68
2	Jane	Brown	75
3	Andy	Brown	42
4	Zöe	Adams	52
5	Roger	Brady	58
6	Clare	Verdon	45

but only displays the information for students whose marks are above 60. At the end of the table, `\DTLsaveastrowcount` is used to store the number of rows in the table. (Note that `\DTLsaveastrowcount` is outside of `\DTLforeach`.)

```
\begin{table}[htbp]
\caption{Top student scores}
\centering
\begin{tabular}{llr}
\bfseries First Name & & \\
\bfseries Surname & & \\
\bfseries Score (\%) & & \\
\DTLforeach*[\DTLisgt{\score}{60}]{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\\
\firstname & \surname & \score}
\end{tabular}

\DTLsaveastrowcount{\n}%
\n\ students scored above 60\%.
\end{table}
```

This produces **Table 6.6**. Note that in this example, I could have specified the condition as `\score>60` since all the scores are integers, however, as it's possible that an entry may feasibly have a decimal score I have used `\DTLisgt` instead.

Table 6.6: Top student scores

First Name	Surname	Score (%)
John	Smith, Jr	68
Jane	Brown	75
2 students scored above 60%.		

Suppose now, I only want to display the scores for students whose surname begins with 'B'. I can do this as follows:

```
\begin{table}[htbp]
\caption{Student scores (B)}
\centering
```

```

\begin{tabular}{llr}
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%)%
\DTLforeach*[\DTLisopenbetween{\surname}{B}{C}]{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\\
\firstname & \surname & \score}
\end{tabular}
\end{table}

```

This produces [Table 6.7](#).

Table 6.7: Student scores (B)

First Name	Surname	Score (%)
Jane	Brown	75
Andy	Brown	42
Roger	Brady	58

Example 6 (Checking for the First Row (booktabs))

Suppose I want to use the `booktabs` package and I want to use `\midrule` after the header row. I can use `\DTLiffirstrow` to check if the loop is on the first row of the iteration. (Remember that you need to load the `booktabs` package in the preamble with `\usepackage{}`.) Using the same database as before:

```

\begin{table}[htbp]
\caption{Student scores (booktabs)}
\centering
\begin{tabular}{llc}
\toprule
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%)%
\DTLforeach*{scores}{%
{\firstname=FirstName,\surname=Surname,\score=Score}{%
%
\DTLiffirstrow{\\ \midrule}{\\}%
\firstname & \surname & \score
}% end of loop
\\ \bottomrule
\end{tabular}%
\end{table}

```

Table 6.8: Student scores (booktabs)

First Name	Surname	Score (%)
John	Smith, Jr	68
Jane	Brown	75
Andy	Brown	42
Zöe	Adams	52
Roger	Brady	58
Clare	Verdon	45

(The commands `\toprule`, `\midrule` and `\bottomrule` are all provided by booktabs.) This produces [Table 6.8](#).

Example 7 (Breaking Out of a Loop)

Suppose I only want to display the first three rows of a database. I could do:²

```
\DTLforeach*[\value{DTLrowi}<3]{scores}%
{\firstname=FirstName,\surname=Surname,\score=Score}{%
\\firstname & \surname & \score
}
```

However, this isn't very efficient, as it still has to iterate through the entire database, checking if the condition is met. If the database has over 100 entries, this will slow the time taken to create the table. It would therefore be much more efficient to break out of the loop when row count exceeds 3:

```
\begin{table}[htbp]
\caption{First Three Rows}
\centering
\begin{tabular}{llr}
\bfseries First Name & \bfseries Surname & \bfseries Score (\%)%
\DTLforeach*{scores}%
{\firstname=FirstName,\surname=Surname,\score=Score}{%
\ifthenelse{\DTLcurrentindex=3}{\dtlbreak}{}%
\\firstname & \surname & \score
}%
\end{tabular}
\end{table}
```

This produces [Table 6.9](#). Note that the loop is not broken until the end of the current iteration, so even though `\dtlbreak` occurs at the start of the third row, the loop isn't

²Recall that `DTLrowi` is incremented after the condition is tested, so it will be out by 1 when the condition is tested which is why `<3` is used instead of `<4`.

finished until the third row is completed. (Recall that `\DTLcurrentindex` must be used before the first instance of `\\` or `&`.) Alternatively, you can use `DTLrowi` instead:

```
\DTLforeach{scores}%
{\firstname=FirstName,\surname=Surname,\score=Score}{%
\\ \firstname & \surname & \score
\ifthenelse{\value{DTLrowi}=3}{\dtlbreak}{}%
}%
```

Table 6.9: First Three Rows

First Name	Surname	Score (%)
John	Smith, Jr	68
Jane	Brown	75
Andy	Brown	42

Example 8 (Stripy Tables)

This example uses the same database as in the previous examples. It requires the `colortbl` package, which provides the command `\rowcolor`. The command `\DTLifodddrow` is used to produce a striped table.

```
\begin{table}[htbp]
\caption{A stripy table}\label{tab:stripy}
\centering
\begin{tabular}{llc}
\bfseries First Name & & \\
\bfseries Surname & & \\
\bfseries Score (\%) & & \\
\DTLforeach*{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\\ \DTLifodddrow{\rowcolor{blue}}{\rowcolor{green}}}%
\firstname & \surname & \score}%
\end{tabular}
\end{table}
```

This produces [Table 6.10](#).

Example 9 (Two Database Rows per Tabular Row)

In order to save space, you may want two database rows per tabular row, when displaying a database in a tabular environment. This can be accomplished using `\DTLifodddrow`. For example

Table 6.10: A stripy table

First Name	Surname	Score (%)
John	Smith, Jr	68
Jane	Brown	75
Andy	Brown	42
Zöe	Adams	52
Roger	Brady	58
Clare	Verdon	45

```

\begin{table}[htbp]
\caption{Two database rows per tabular row}
\centering
\begin{tabular}{llc}
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%) &
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%)%
\DTLforeach*{scores}{\firstname=FirstName, \surname=Surname, \score=Score}{%
\DTLifoddrow{\}\{\&}%
\firstname & \surname & \score}%
\end{tabular}
\end{table}

```

produces [Table 6.11](#)

Table 6.11: Two database rows per tabular row

First Name	Surname	Score (%)	First Name	Surname	Score (%)
John	Smith, Jr	68	Jane	Brown	75
Andy	Brown	42	Zöe	Adams	52
Roger	Brady	58	Clare	Verdon	45

(To order column-wise, instead of row-wise, see [example 20](#).)

Example 10 (Iterating Through Keys in a Row)

Suppose you have lots of columns in your database, and you want to display them all without having to set a variable for each column. You can leave the assignment list in `\DTLforeach` blank, and iterate through the keys using `\DTLforeachkeyinrow`. For example:

```

\begin{table}[htbp]

```

```

\caption{Student Scores (Iterating Through Keys)}
\centering
\begin{tabular}{llll}
\bfseries First Name & \bfseries Surname &
\bfseries Registration No. &
\bfseries Score (\%)%
\DTLforeach*{scores}{}{}%
\\gdef\doamp{\gdef\doamp{&}}%
\DTLforeachkeyinrow{\thisValue}{\doamp\thisValue}}%
\end{tabular}
\end{table}

```

This produces [Table 6.12](#).

Table 6.12: Student Scores (Iterating Through Keys)

First Name	Surname	Registration No.	Score (%)
John	Smith, Jr	102689	68
Jane	Brown	102647	75
Andy	Brown	103569	42
Zöe	Adams	105987	52
Roger	Brady	106872	58
Clare	Verdon	104356	45

Note that the & must be between columns, so I have defined a command called `\doamp` that on first use redefines itself to do &. So, for each row, at the start of the key iteration, `\doamp` does nothing, and on subsequent iterations it does &. This ensures that the correct number of &s are used. Since each cell in the tabular environment is scoped, `\gdef` is needed instead of `\def`.

In the above, I needed to know how many columns are in the database, and the order that the headings should appear. If you are unsure, you can use `\dtlforeachkey` to determine the number of columns and to display the header row. For example:

```

\begin{table}[htbp]
\caption{Student Scores}
\centering
% Work out the column alignments.
\def\colalign{}%
\dtlforeachkey(\theKey,\theCol,\theType,\theHead)\in{scores}\do
{\edef\colalign{\colalign l}}%
% Begin the tabular environment.
\edef\dobegintabular{\noexpand\begin{tabular}{\colalign}}%
\dobegintabular
% Do the header row.
\gdef\doamp{\gdef\doamp{&}}%
\dtlforeachkey(\theKey,\theCol,\theType,\theHead)\in{scores}\do
{\doamp\bfseries \theHead}%

```

```

% Iterate through the data.
\DTLforeach*{scores}{}{}%
\\gdef\doamp{\gdef\doamp{&}}%
\DTLforeachkeyinrow{\thisValue}{\doamp\thisValue}}%
\end{tabular}
\end{table}

```

Table 6.13: Student Scores (Using `\dtlforeachkey` and `\DTLforeachkeyinrow`)

FirstName	Surname	StudentNo	Score
John	Smith, Jr	102689	68
Jane	Brown	102647	75
Andy	Brown	103569	42
Zöe	Adams	105987	52
Roger	Brady	106872	58
Clare	Verdon	104356	45

Notes:

- In order to determine the column alignment for the tabular environment, I first define `\colalign` to nothing, and then I iterate through the keys appending `l` to `\colalign`. Since `\colalign` only contains alphabetical characters, I can just use `\edef` for this. I could modify this to check the data type and, say, use `l` (left alignment) for columns containing strings and `c` (centred) for the other columns:

```

\dtlforeachkey(\theKey, \theCol, \theType, \theHead) \in{scores} \do
{\ifnum\theType=0 \relax
  \edef\colalign{\colalign l} % column contains strings
  \else
    \edef\colalign{\colalign c} % column contains numerical values
  \fi
}%

```

- To ensure `\colalign` gets correct expanded when passed to the tabular environment I temporarily define `\dobegintabular` to the code required to start the tabular environment:

```

\edef\dobegintabular{\noexpand\begin{tabular}{\colalign}}%

```

This sets `\dobegintabular` to `\begin{tabular}{llll}`. After defining `\dobegintabular`, I then need to use it.

- As before, I use `\doamp` to put the ampersands between columns.

- Recall that I can set the headers using `\DTLsetheader` or using the `headers` key when loading the data from an external file. For example:

```
\DTLsetheaders{scores}{FirstName}{First Name}
\DTLsetheaders{scores}{Score}{Score (\%)}
```

Recall that `\DTLforeachkeyinrow` sets `\dtlkey` to the current key. This can be used to filter out columns. Alternatively, if you know the column index, you can test `\dtlcol` instead. The following code modifies the above example so that it filters out the column whose key is `StudentNo`:

```
\begin{table}[htbp]
\caption{Student Scores (Filtering Out a Column)}
\centering
\def\colalign{}%
\dtlforeachkey(\theKey,\theCol,\theType,\theHead)\in{scores}\do
{\DTLifreq{\theKey}{StudentNo}{}{\edef\colalign{\colalign 1}}}%
\edef\dobegintabular{\noexpand\begin{tabular}{\colalign}}%
\dobegintabular
\gdef\doamp{\gdef\doamp{&}}%
\dtlforeachkey(\theKey,\theCol,\theType,\theHead)\in{scores}\do
{\DTLifreq{\theKey}{StudentNo}{}{\doamp\bfseries \theHead}}%
\DTLforeach*{scores}{}{}%
\\ \gdef\doamp{\gdef\doamp{&}}%
\DTLforeachkeyinrow{\thisValue}{%
\DTLifreq{\dtlkey}{StudentNo}{}{\doamp\thisValue}}%
\end{tabular}
\end{table}
```

The result is shown in [Table 6.14](#).

Table 6.14: Student Scores (Filtering Out a Column)

FirstName	Surname	Score
John	Smith, Jr	68
Jane	Brown	75
Andy	Brown	42
Zöe	Adams	52
Roger	Brady	58
Clare	Verdon	45

Example 11 (Nested `\DTLforeach`)

In this example I have a CSV file called `index.csv` which contains:

```
File, Temperature, NaCl, pH
exp25a.csv, 25, 4.7, 0.5
exp25b.csv, 25, 4.8, 1.5
exp30a.csv, 30, 5.12, 4.5
```

The first column of this file contains the name of another CSV file which has the results of a time to growth experiment performed at the given incubation temperature, salt concentration and pH. The file `exp25a.csv` contains the following:

```
Time, Log Count
0, 3.75
23, 3.9
45, 4.0
```

The file `exp25b.csv` contains the following:

```
Time, Log Count
0, 3.6
60, 3.8
120, 4.0
```

The file `exp30a.csv` contains the following:

```
Time, Log Count
0, 3.73
23, 3.67
60, 4.9
```

Suppose I now want to iterate through `index.csv`, load the given file, and create a table for that data. I can do this using nested `\DTLforeach` as follows:

```
% load index data file
\DTLloaddb{index}{index.csv}

% iterate through index database
\DTLforeach{index}{\theFile=File, \theTemp=Temperature, %
\theNaCl=NaCl, \thepH=pH}{%
% load results file into database of the same name
\DTLloaddb{\theFile}{\theFile}%
% Create a table
\begin{table}[htbp]
\caption{Temperature = \theTemp, NaCl = \theNaCl,
pH = \thepH}\label{tab:\theFile}
\centering
\begin{tabular}{rl}
\bfseries Time & \bfseries Log Count
\DTLforeach{\theFile}{\theTime=Time, \theLogCount=Log Count}{%
\\ \theTime & \theLogCount}%
\end{tabular}
\end{table}
}
```

Table 6.15: Temperature = 25, NaCl = 4.7, pH = 0.5

Time	Log Count
0	3.75
23	3.9
45	4.0

Table 6.16: Temperature = 25, NaCl = 4.8, pH = 1.5

Time	Log Count
0	3.6
60	3.8
120	4.0

This creates [Table 6.15](#) to [Table 6.17](#). (Note that each table is given a label that is based on the database name, to ensure that it is unique.)

Example 12 (Dynamically Allocating Field Name)

(This example was suggested by Bill Hobbs.) Suppose you have a directory containing members of multiple clubs. The CSV file (say, `clubs.csv`) may look something like:

```
First Name,Surname,Rockin,Single
John,"Smith, Jr",member,
Jane,Brown,,friend
Andy,Brown,friend,member
Z\"oe,Adams,member,member
Roger,Brady,friend,friend
Clare,Verdon,member,
```

(Blank entries indicate that the person is not a member of that club.) The data can be loaded as follows:

```
\DTLloaddb{clubs}{clubs.csv}
```

Table 6.17: Temperature = 30, NaCl = 5.12, pH = 4.5

Time	Log Count
0	3.73
23	3.67
60	4.9

Suppose at the beginning of your document you have specified which club you are interested in (Rockin or Single) and store it in \DIdent:

```
\newcommand{\DIdent}{Rockin}
```

You can now display the members for this particular club as follows:

```
\begin{table}[htbp]
\caption{Club Membership}
\centering
\begin{tabular}{lll}
\bfseries First Name & \bfseries Surname & \bfseries Status \\
\DTLforeach*[\not\DTLiseq{\status}{}]{clubs}
{\firstname=First Name,\surname=Surname,\status=\DIdent}{%
\\firstname & \surname & \status
}%
\end{tabular}
\end{table}
```

The result is shown in [Table 6.18](#).

Table 6.18: Club Membership

First Name	Surname	Status
John	Smith, Jr	member
Andy	Brown	friend
Zöe	Adams	member
Roger	Brady	friend
Clare	Verdon	member

6.5 Null Values

Note that a null value is not the same as an empty value. Empty values can be tested using etoolbox's \ifdefempty or similar.

If a database is created using \DTLnewdb, \DTLnewrow and \DTLnewdbentry (rather than loading it from an ASCII file), it is possible for some of the entries to have null values when a value is not assigned to a given key for a given row. It's also possible for data fetched from a SQL database using datatooltk to contain null values, and you can use the datatooltk GUI to assign null values, but data loaded using \DTLloaddb (or \DTLloadrawdb) will have empty not null values for any *blank* cells. However, you will get null values when loading a CSV file if cells are missing (rather than empty). For example:

```
Column 1,Column 2,Column 3
Foo,Bar
Foo,,Baz
Foo,Bar,Baz
```

This has an empty cell (the second column in `Foo,,Baz`) and a null cell (the third column in `Foo,Bar`). If the first row of data was instead

```
Foo,Bar,
```

then the third column is now empty, not null.

When you iterate through the database using `\DTLforeach` (described in [section 6.4](#)), if an entry is missing for a given row, the associated command given in the `<values>` argument will be set to a null value. This value depends on the data type associated with the given key.

```
\DTLstringnull
```

```
\DTLstringnull
```

This is the null value for a string.

```
\DTLnumbernull
```

```
\DTLnumbernull
```

This is the null value for a number.

```
\DTLifnull
```

```
\DTLifnull{<cmd>}{<true part>}{<false part>}
```

This checks if `<cmd>` is null where `<cmd>` is a control sequence, if it is, then `<true part>` is done, otherwise `<false part>` is done. This macro is illustrated in [example 13](#) below.

```
\DTLifnullorepty
```

```
\DTLifnullorepty{<cmd>}{<true part>}{<false part>}
```

This checks if `<cmd>` is null or empty, where `<cmd>` is a control sequence. If it is it does `<true part>`, otherwise `<false part>`.

Example 13 (Null vs Empty Values)

Consider the following (which creates a database called `emailDB`):

```
\DTLnewdb{emailDB}
\DTLnewrow{emailDB}
\DTLnewdbentry{emailDB}{Surname}{Jones}
\DTLnewdbentry{emailDB}{FirstName}{Mary}
\DTLnewdbentry{emailDB}{Email1}{mj@my.uni.ac.uk}
```



```

\DTLnewbentry{emailDB}{Email2}{mj@somewhere.com}
\DTLnewrow{emailDB}
\DTLnewbentry{emailDB}{Surname}{Smith}
\DTLnewbentry{emailDB}{FirstName}{Adam}
\DTLnewbentry{emailDB}{Email1}{as@my.uni.ac.uk}
\DTLnewbentry{emailDB}{RegNum}{12345}

```

In the above example, the first row of the database contains an entry with the key `Email2`, but the second row doesn't. Whereas the second row contains an entry with the key `RegNum`, but the first row doesn't. That is, this database has two null (not empty) values.

The following code puts the information in a tabular environment:

```

\begin{tabular}{lllll}
\bfseries First Name &
\bfseries Surname &
\bfseries Email 1 &
\bfseries Email 2 &
\bfseries Reg Num%
\DTLforeach*{emailDB}{\firstname=FirstName,\surname=Surname,%
\emailI=Email1,\emailII=Email2,\regnum=RegNum}{%
\\ \firstname & \surname & \emailI & \emailII & \regnum}%
\end{tabular}

```

This produces the following:

First Name	Surname	Email 1	Email 2	Reg Num
Mary	Jones	mj@my.uni.ac.uk	mj@somewhere.com	0
Adam	Smith	as@my.uni.ac.uk	NULL	12345

Note that on the first row of data, the registration number appears as 0, while on the next row, the second email address appears as NULL. The `datatool` package has identified the key `RegNum` for this database as a numerical key, since all elements in the database with that key are numerical, whereas it has identified the key `Email2` as a string, since there is at least one element in this database with that key that is a string. Null numerical values are set to `\DTLnumbernull (0)`, and null strings are set to `\DTLstringnull (NULL)`.

The following code checks each value to determine whether it is null using `\DTLifnull`. If it is, the text *Missing* is inserted, otherwise the value itself is used:

```

\begin{tabular}{lllll}
\bfseries First Name &
\bfseries Surname &
\bfseries Email 1 &
\bfseries Email 2 &
\bfseries Reg Num%
\DTLforeach{emailDB}{\firstname=FirstName,\surname=Surname,%
\emailI=Email1,\emailII=Email2,\regnum=RegNum}{%

```

```

\\DTLifnull{\firstname}{\emph{Missing}}{\firstname} &
\DTLifnull{\surname}{\emph{Missing}}{\surname} &
\DTLifnull{\emailI}{\emph{Missing}}{\emailI} &
\DTLifnull{\emailII}{\emph{Missing}}{\emailII} &
\DTLifnull{\regnum}{\emph{Missing}}{\regnum}}%
\end{tabular}

```

This produces the following:

First Name	Surname	Email 1	Email 2	Reg Num
Mary	Jones	mj@my.uni.ac.uk	mj@somewhere.com	<i>Missing</i>
Adam	Smith	as@my.uni.ac.uk	<i>Missing</i>	12345

If you want to do this, you may find it easier to define a convenience command that will display some appropriate text if an entry is missing, for example:

```
\newcommand*{\checkmissing}[1]{\DTLifnull{#1}{---}{#1}}
```

Then instead of typing, say,

```
\DTLifnull{\regnum}{---}{\regnum}
```

you can instead type:

```
\checkmissing{\regnum}
```

Now suppose that instead of defining the database using `\DTLnewdb`, `\DTLnewrow` and `\DTLnewdbentry`, you have a file with the contents:

```

Surname,FirstName,RegNum,Email1,Email2
Jones,Mary,,mj@my.uni.ac.uk,mj@somewhere.com
Smith,Adam,12345,as@my.uni.ac.uk,

```

and you load the data from this file using `\DTLloaddb` (defined in [section 6.2](#)). Now the database has *no null values*, but has an *empty* value for the key `RegNum` on the first row of the database, and an empty value for the key `Email2` on the second row of the database. Now, the following code

```

\begin{tabular}{lllll}
\bfseries First Name &
\bfseries Surname &
\bfseries Email 1 &
\bfseries Email 2 &
\bfseries Reg Number%
\DTLforeach{emailDB}{\firstname=FirstName,\surname=Surname,%
\emailI=Email1,\emailII=Email2,\regnum=RegNum}{%
\\DTLifnull{\firstname}{\emph{Missing}}{\firstname} &
\DTLifnull{\surname}{\emph{Missing}}{\surname} &
\DTLifnull{\emailI}{\emph{Missing}}{\emailI} &

```

```
\DTLifnull{\emailIII}{\emph{Missing}}{\emailIII} &
\DTLifnull{\regnum}{\emph{Missing}}{\regnum}}%
\end{tabular}
```

produces:

First Name	Surname	Email 1	Email 2	Reg Number
Mary	Jones	mj@my.uni.ac.uk	mj@somewhere.com	
Adam	Smith	as@my.uni.ac.uk		12345

Now the missing entries are simply blank instead of containing *Missing*. This is because they're empty not null. In this case, you may prefer to use

`\DTLifnulloreempty` instead of `\DTLifnull`.

6.6 Editing Database Rows

A row can be removed from a data base using:

`\DTLremove`

```
\DTLremove{<db name>}{<row index>}
```

where *<row index>* is the index of the unwanted row. For example:

```
\DTLremove{scores}{2}
```

will delete the second row in the database labelled "scores". There is also a starred version that doesn't check for the existence of the database. Remember that the row index refers to the internal data not to a reference in the external source if the data has been input.

The following commands may be used in the body of the `\DTLforeach` loop,³ to edit the current row of the loop. (See also [subsection 6.11.1](#).)

`\DTLappend`

```
\DTLappend{<key>}{<value>}
```

This appends a new entry with the given *<key>* and *<value>* to the current row. (*<value>* is expanded.)

`\DTLreplace`

```
\DTLreplace{<key>}{<value>}
```

This replaces the entry for *<key>* with *<value>*. (*<value>* is expanded.)

`\DTLremoveentryfromrow`

```
\DTLremoveentryfromrow{<key>}
```

This removes the entry for *<key>* from the current row.

`\DTLremovecurrentrow`

```
\DTLremovecurrentrow
```

This removes the current row from the database.

Example 14 (Editing Database Rows)

In this example I have a CSV file called `marks.csv` that contains student marks for three assignments:

```
Surname,FirstName,StudentNo,Assignment 1,Assignment
2,Assignment 3
"Smith, Jr",John,102689,68,57,72
"Brown",Jane,102647,75,84,80
"Brown",Andy,103569,42,52,54
"Adams",Zöe,105987,52,48,57
"Brady",Roger,106872,58,60,62
"Verdon",Clare,104356,45,50,48
```

First load this into a database called `marks`:

```
\DTLloaddb{marks}{marks.csv}
```

Suppose now I want to compute the average mark for each student, and append this to the database. I can do this as follows:

```
\DTLforeach{marks}{%
\assignI=Assignment 1,%
\assignII=Assignment 2,%
\assignIII=Assignment 3}{%
\DTLmeanforall{\theMean}{\assignI,\assignII,\assignIII}%
\DTLappendtorow{Average}{\theMean}}
```

For each row in the `marks` database, I now have an extra key called `Average` that contains the average mark over all three assignments for a given student. I can now put this data into a table:

```
\begin{table}[htbp]
\caption{Student marks}
\centering
\begin{tabular}{llcccc}
\bfseries Surname & \bfseries First Name &
\bfseries Assign 1 & & & &
\end{tabular}
```

³Only the unstarred version of `\DTLforeach`; the starred version is read-only.

```

\bfseries Assign 2 &
\bfseries Assign 3 &
\bfseries Average Mark%
\DTLforeach{marks}%
{% assign variable
  \surname=Surname,\firstname=FirstName,%
  \average=Average,\assignI=Assignment 1,%
  \assignII=Assignment 2,\assignIII=Assignment 3}%
{% start new row
  \\ \surname & \firstname & \assignI & \assignII & \assignIII &
  \DTLround{\average}{\average}{2}% round to 2 dp
  \DTLclip{\average}{average}%clip unnecessary 0s
  \average
}\relax
\end{tabular}
\end{table}

```

This produces [Table 6.19](#).

Note that if I only wanted the averages for the table and nothing else, I could simply have computed the average in each row of the table and displayed it without adding the information to the database, however I am going to reuse this information in [example 37](#), so adding it to the database means that I don't need to recompute the mean.

Table 6.19: Student marks

Surname	First Name	Assign 1	Assign 2	Assign 3	Average Mark
Smith, Jr	John	68	57	72	65.67
Brown	Jane	75	84	80	79.67
Brown	Andy	42	52	54	49.33
Adams	Zöe	52	48	57	52.33
Brady	Roger	58	60	62	60
Verdon	Clare	45	50	48	47.67

6.7 Arithmetical Computations on Database Entries

The commands used in [chapter 3](#) can be used on database entries. You can, of course, directly use the commands provided by the `fp` package if you know that the values are in the correct format (i.e. no currency symbols, no number group separators and a full stop as the decimal point) but if this is not the case, then you should use the commands described in [chapter 3](#). If you want to use a command provided by the `fp` package, that does not have a wrapper function in `datatool`, then you will need to convert the value using `\DTLconverttodecimal`, and convert it back using either `\DTLdecimaltolocale` or `\DTLdecimaltocurrency`.

Example 15 (Arithmetical Computations)

In this example, I am going to produce a table similar to [Table 6.4](#), except that I want to add an extra row at the end which contains the average score.

```
\begin{table}[htbp]
\caption{Student scores}\label{tab:mean}
\centering
\def\total{0}%
\begin{tabular}{llr}
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%)%
\DTLforeach{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\\
\firstname & \surname &
\DTLgadd{\total}{\score}{\total}%
\score
}\\
\multicolumn{2}{l}{\bfseries Average Score} &
\DTLsavelastrowcount{\n}%
\DTLdiv{\average}{\total}{\n}%
\DTLround{\average}{\average}{2}%
\average
\end{tabular}
\end{table}
```

This produces [Table 6.20](#). **Notes:**

- I had to use `\DTLgadd` rather than `\DTLadd` since it occurs within a tabular environment which puts each entry in a local scope.
- I used `\DTLsavelastrowcount` to store the number of rows produced by `\DTLforeach` in the control sequence `\n`.
- I used `\DTLround` to round the average score to 2 decimal places.

Table 6.20: Student scores

First Name	Surname	Score (%)
John	Smith, Jr	68
Jane	Brown	75
Andy	Brown	42
Zöe	Adams	52
Roger	Brady	58
Clare	Verdon	45
Average Score		56.67



`\DTLsumforkeys`

```
\DTLsumforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}
```

This command sums all the entries over all the databases listed in the comma separated list of database names *<db list>* for each key in *<key list>* where the condition given by *<condition>* is true. The second optional argument *<assign list>* is the same as the assignment list used by `\DTLforeach`, so that you can use the information in *<condition>*. The result is stored in *<cmd>* which must be a control sequence. For example:

```
\DTLsumforkeys{scores}{Score}{\total}
```

sets `\total` to the sum of all the scores in the database called `scores`.

`\DTLsumcolumn`

```
\DTLsumcolumn{<db>}{<key>}{<cmd>}
```

This is a faster version of `\DTLsumforkeys` that only sums the entries in a single column (specified by *<key>*) for a single database (specified by *<db>*) and doesn't provide any filtering. The result is stored in *<cmd>* which must be a control sequence.

`\DTLmeanforkeys`

```
\DTLmeanforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}
```

This command computes the arithmetic mean of all the entries over all the databases listed in *<db list>* for all keys in *<key list>* where the condition given by *<condition>* is true. The second optional argument *<assign list>* is the same as the assignment list used by `\DTLforeach`, so that you can use the information in *<condition>*. The result is stored in *<cmd>* which must be a control sequence. For example:

```
\DTLmeanforkeys{scores}{Score}{\average}
```

sets `\average` to the mean of all the scores in the database called `scores`.

`\DTLmeanforcolumn`

```
\DTLmeanforcolumn{<db>}{<key>}{<cmd>}
```

This is a faster version of `\DTLmeanforkeys` that only computes the mean for a single column (specified by *<key>*) for a single database (specified by *<db>*) and doesn't provide any filtering. The result is stored in *<cmd>* which must be a control sequence.

`\DTLvarianceforkeys`

```
\DTLvarianceforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}
```

This command computes the variance of all the entries over all the databases listed in *<db list>* for all keys in *<key list>* where the condition given by *<condition>* is true. The second optional argument *<assign list>* is the same as the assignment list used by `\DTLforeach`, so that you can use the information in *<condition>*. The result is stored in *<cmd>* which must be a control sequence.

`\DTLvarianceforcolumn`

```
\DTLvarianceforcolumn{<db>}{<key>}{<cmd>}
```

This is a faster version of `\DTLvarianceforkeys` that only computes the variance for a single column (specified by *<key>*) for a single database (specified by *<db>*) and doesn't provide any filtering. The result is stored in *<cmd>* which must be a control sequence.

`\DTLsdforkeys`

```
\DTLsdforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}
```

This command computes the standard deviation of all the entries over all the databases listed in *<db list>* for all keys in *<key list>* where the condition given by *<condition>* is true. The second optional argument *<assign list>* is the same as the assignment list used by `\DTLforeach`, so that you can use the information in *<condition>*. The result is stored in *<cmd>* which must be a control sequence.

`\DTLsdforcolumn`

```
\DTLsdforcolumn{<db>}{<key>}{<cmd>}
```

This is a faster version of `\DTLsdforkeys` that only computes the standard deviation for a single column (specified by *<key>*) for a single database (specified by *<db>*) and doesn't provide any filtering. The result is stored in *<cmd>* which must be a control sequence.

`\DTLminforkeys`

```
\DTLminforkeys[<condition>][<assign list>]{<db list>}{<key list>}{<cmd>}
```

This command determines the minimum value over all entries for all keys in *<key list>* over all the databases listed in *<db list>* where *<condition>* is true. The second optional argument *<assign list>* is the same as the assignment list used by `\DTLforeach`, so

that you can use the information in $\langle condition \rangle$. The result is stored in $\langle cmd \rangle$, which must be a control sequence. For example

```
\DTLminforkeys{scores}{Score}{\theMin}
```

sets \theMin to the minimum score in the database.

\backslash DTLminforcolumn

```
\DTLminforcolumn{\langle db \rangle}{\langle key \rangle}{\langle cmd \rangle}
```

This is a faster version of \backslash DTLminforkeys that only computes the minimum for a single column (specified by $\langle key \rangle$) for a single database (specified by $\langle db \rangle$) and doesn't provide any filtering. The result is stored in $\langle cmd \rangle$ which must be a control sequence.

\backslash DTLmaxforkeys

```
\DTLmaxforkeys[\langle condition \rangle][\langle assign list \rangle]{\langle db list \rangle}{\langle key list \rangle}{\langle cmd \rangle}
```

This command determines the maximum value over all entries for all keys in $\langle key list \rangle$ over all the databases listed in $\langle db list \rangle$ where $\langle condition \rangle$ is true. The second optional argument $\langle assign list \rangle$ is the same as the assignment list used by \backslash DTLforeach, so that you can use the information in $\langle condition \rangle$. The result is stored in $\langle cmd \rangle$, which must be a control sequence. For example

```
\DTLminforkeys{scores}{Score}{\theMax}
```

sets \theMax to the minimum score in the database.

\backslash DTLmaxforcolumn

```
\DTLmaxforcolumn{\langle db \rangle}{\langle key \rangle}{\langle cmd \rangle}
```

This is a faster version of \backslash DTLmaxforkeys that only computes the maximum for a single column (specified by $\langle key \rangle$) for a single database (specified by $\langle db \rangle$) and doesn't provide any filtering. The result is stored in $\langle cmd \rangle$ which must be a control sequence.

\backslash DTLcomputebounds

```
\DTLcomputebounds{\langle db list \rangle}{\langle x key \rangle}{\langle y key \rangle}{\langle minX cmd \rangle}{\langle minY cmd \rangle}{\langle maxX cmd \rangle}{\langle maxY cmd \rangle}
```

Computes the maximum and minimum x and y values over all the databases listed in $\langle db list \rangle$ where the x value is given by $\langle x key \rangle$ and the y value is given by $\langle y key \rangle$. The results are stored in $\langle minX cmd \rangle$, $\langle minY cmd \rangle$, $\langle maxX cmd \rangle$ and $\langle maxY cmd \rangle$.

Example 16 (Mail Merging)

This example uses the database given in [example 3](#) and uses \backslash DTLmeanforkeys to

determine the average score. A letter is then created for each student to inform them of their score and the class average.

```
\documentclass{letter}

\usepackage{datatool}

\begin{document}
  % load database
  \DTLloaddb{scores}{studentscores.csv}
  % compute arithmetic mean for key `Score'
  \DTLmeanforkeys{scores}{Score}{\average}
  % Round the average to 2 decimal places
  \DTLround{\average}{\average}{2}
  % Save the highest score in \maxscore
  \DTLmaxforkeys{scores}{Score}{\maxscore}

  \DTLforeach{scores}{\firstname=FirstName,\surname=Surname,%
  \score=Score}{%
  \begin{letter}{}
  \opening{Dear \firstname\ \surname}

  \DTLifnumgt{\score}{60}{Congratulations you}{You} achieved a score
  of \score\% which was \DTLifnumgt{\score}{\average}{above}{below}
  the average of \average\%. \DTLifnumeq{\score}{\maxscore}{You
  achieved the highest score}{The top score was \maxscore}.

  \closing{Yours Sincerely}
  \end{letter}
  }
\end{document}
```

To determine a person's gender when mail merging, see [chapter 12](#).

6.8 Sorting a Database

The sort methods described here use \TeX to sort, which is very inefficient. The comparison handlers use a character code comparison rather than locale-sensitive alphabetic ordering. It's more efficient to use `datatooltk` to import and sort at the same time.

`\dtlsort`

```
\dtlsort[⟨replacement key list⟩]{⟨sort criteria⟩}{⟨db name⟩}
{⟨handler⟩}
```

This will sort the database called *<db name>* according to the criteria given by *<sort criteria>*, which must be a comma separated list of keys and optionally =*<order>*, where *<order>* is either ascending or descending. If the order is omitted, ascending is assumed. The database keeps track of the data type for a given key, and uses this to determine whether an alphabetical or numerical sort is required.

The final argument *<handler>* is the command used for the comparisons and is the same as the *<criteria cs>* command used by `\dtlsortlist` and `\dtlininsertinto`, described in Section 5. The predefined handlers are:

`\dtlcompare` A case-sensitive comparison.

`\dtlicompare` A case-insensitive comparison.

`\dtlwordindexcompare` English word-ordering comparison for indexes, as described by the Oxford Style Manual.

`\dtlletterindexcompare` English letter-ordering comparison for indexes.

The last two handlers, `\dtlwordindexcompare` and `\dtlletterindexcompare`, assume that inversion commas are indicated using one of the following commands:

- To indicate name inversion:

`\datatoolpersoncomma`

```
\datatoolpersoncomma
```

Example: Knuth\datatoolpersoncomma Donald E.

- To indicate place inversion:

`\datatoolplacecomma`

```
\datatoolplacecomma
```

Example: New York\datatoolplacecomma USA

- To indicate subject inversion:

`\datatoolsubjectcomma`

```
\datatoolsubjectcomma
```

Example: New York\datatoolsubjectcomma population

In addition, the start of parenthetical material should be indicated with

`\datatoolparenstart`

```
\datatoolparenstart
```

Example: High Water\datatoolparenstart play

Following the guidelines of the Oxford Style Manual, when sorting terms that have identical pre-inversion parts, the following ordering is applied: people, places, subjects, no inversions and parenthetical.

Example 17 (Sorting a Database—Dealing with Inversions)

This uses the example given in Chapter 16 of the Oxford Style Manual. Suppose I define my database as follows:

```
\DTLnewdb{inversiondata}  
\DTLnewrow{inversiondata}  
\DTLnewdbentry{inversiondata}{Term}{New York, New York}  
\DTLnewrow{inversiondata}  
\DTLnewdbentry{inversiondata}{Term}{New York\datatoolsubjectcomma  
population}  
\DTLnewrow{inversiondata}  
\DTLnewdbentry{inversiondata}{Term}{New York\datatoolplacecomma  
USA}  
\DTLnewrow{inversiondata}  
\DTLnewdbentry{inversiondata}{Term}{New York\datatoolpersoncomma  
Earl of}
```

First of all, display the unsorted data:

```
\DTLdisplaydb{inversiondata}
```

This produces:

```
Term  
New York, New York  
New York, population  
New York, USA  
New York, Earl of
```

Now sort the data using the `\dtlwordindexcompare` handler:

```
\dtlsort{Term}{inversiondata}{\dtlwordindexcompare}
```

and display again:

```
\DTLdisplaydb{inversiondata}
```

which now produces:

Term

New York, Earl of
New York, USA
New York, population
New York, New York

There are three entries here with pre-inversion text that's simply `New York`. Since each of these three entries has the same pre-inversion text, they need to be sorted according to the type of inversion: person, place, subject. The fourth entry (`New York, New York`) doesn't have an inversion since the comma is part of the title of the named work. It's therefore sorted according to `New York, New York` rather than just `New York` and so comes after all the `New York` entries.

If you want to write your own comparison handler, see the documented code for details on the syntax of the handler. (You may want to consider uploading your handler as a separate package to CTAN if you think it will be of general use.)

As from version 2.24, the predefined handlers now have limited support for UTF-8 characters. *This is still experimental*. The support will automatically be switched on if the `inputenc` package is loaded with the `utf8` option before loading `datatool-base` (which is automatically loaded by `datatool`). If `inputenc` is loaded after `datatool-base`, you can use the (boolean) `utf8` option when you load `datatool-base` to enable it. For example, either:

```
\usepackage[utf8]{inputenc}  
\usepackage{datatool-base}
```

or

```
\usepackage[utf8]{datatool-base}  
\usepackage[utf8]{inputenc}
```

(As from version 2.28, you can now also pass the `utf8` option to `datatool` and `datagidx`.) You can also enable this option after `datatool-base` has been loaded using

```
\dtlenableUTFviii
```

```
\dtlenableUTFviii
```

or disable it with

```
\dtldisableUTFviii
```

```
\dtldisableUTFviii
```

For example:

```
\usepackage[utf8]{inputenc}  
\usepackage{datatool}  
\dtldisableUTFviii
```

This option isn't required for $X_{\text{q}}\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$, which treats each UTF-8 character as an individual token.

With regular (pdf) $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ (as opposed to $X_{\text{q}}\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$) each UTF-8 character is actually treated as two tokens that represent the first and second octet of the UTF-8 character. This means that it's not possible for $\text{T}_{\text{E}}\text{X}$ to obtain a character code using the usual backtick method, so (with this option enabled) if a UTF-8 character is detected, the handlers described above will pass both octet tokens to one of the following commands:

```
\dtlsetUTFviiiicharcode
```

```
\dtlsetUTFviiiicharcode{\langle octet tokens \rangle}{\langle count \rangle}
```

(for the case-sensitive handler `\dltcompare`) and

```
\dtlsetUTFviiilccharcode
```

```
\dtlsetUTFviiilccharcode{\langle octet tokens \rangle}{\langle count \rangle}
```

(for the case-insensitive handlers).

By default the first simply does:

```
\dtlsetdefaultUTFviiiicharcode
```

```
\dtlsetdefaultUTFviiiicharcode{\langle octet tokens \rangle}{\langle count \rangle}
```

and the second does

```
\dtlsetdefaultUTFviiilccharcode
```

```
\dtlsetdefaultUTFviiilccharcode{\langle octet tokens \rangle}{\langle count \rangle}
```

In all the above `\langle octet tokens \rangle` are the two octets forming the UTF-8 character and `\langle count \rangle` is a count register in which to store the relevant character code.

The default commands simply set the character code for certain common accented Latin characters (such as é) to the code for their unaccented version (such as e). You can redefine `\dtlsetUTFviiiicharcode` and `\dtlsetUTFviiilccharcode` to test for additional characters. For example, to add the Norwegian characters æ, ø and å to the end of the Latin alphabet, you can do:

```
\renewcommand*{\dtlsetUTFviiiicharcode}[2]{%
  \ifstrequal{#1}{Æ}%
  {%
    #2=91\relax
  }%
  {%
    \ifstrequal{#1}{Ø}%
    {%
      #2=92\relax
```

```

}%
{%
  \ifstrequal{#1}{Å}%
  {%
    #2=93\relax
  }%
{%
  \ifstrequal{#1}{æ}%
  {%
    #2=123\relax
  }%
{%
  \ifstrequal{#1}{ø}%
  {%
    #2=124\relax
  }%
{%
  \ifstrequal{#1}{å}%
  {%
    #2=125\relax
  }%
  {%
    \dtlsetdefaultUTFviiicharcode{#1}{#2}%
  }%
}%
}%
}%
}%
}%
}%
}%
}

\renewcommand*{\dtlsetUTFviiilccharcode}[2]{%
  \ifstrequal{#1}{Æ}%
  {%
    #2=123\relax
  }%
{%
  \ifstrequal{#1}{Ø}%
  {%
    #2=124\relax
  }%
{%
  \ifstrequal{#1}{Å}%
  {%
    #2=125\relax
  }%
  {%
    \ifstrequal{#1}{æ}%
    {%

```

```

        #2=123\relax
    }%
    {%
        \ifstrequal{#1}{ø}%
        {%
            #2=124\relax
        }%
        {%
            \ifstrequal{#1}{å}%
            {%
                #2=125\relax
            }%
            {%
                \dtlsetdefaultUTFviiiilccharcode{#1}{#2}%
            }%
        }%
    }%
}

```

In the case where a character is a single token (for example, with Latin-1 encoding), the code associated with that character is set using

`\dtlsetcharcode`

```
\dtlsetcharcode{<c>}{<count register>}
```

(for case-sensitive comparison) and

`\dtlsetlccharcode`

```
\dtlsetlccharcode{<c>}{<count register>}
```

(for case-insensitive comparison), where `<c>` is the character and `<count register>` is a count register. The default definitions are:

```

\newcommand*{\dtlsetcharcode}[2]{#2=`#1\relax}
\newcommand*{\dtlsetlccharcode}[2]{#2=\lccode`#1\relax}

```

So, for example, the letter “e” has the code 101 whereas (with the Latin-1 encoding) the letter “é” has the code 233. This means that “é” will be sorted after “e”. It may be that you want “é” to be treated the same as “e” when making the comparison. In this case, you need to redefine `\dtlsetcharcode` and `\dtlsetlccharcode`. For example, for the case-sensitive comparisons:

```

\renewcommand*{\dtlsetcharcode}[2]{%
    \ifstrequal{#1}{É}%
    {%

```



```

    #2=`E\relax
}%
{%
  \ifstrequal{#1}{é}%
  {%
    #2=`e\relax
  }%
  {%
    #2=`#1\relax
  }%
}%
}

```

and for the case-insensitive comparisons:

```

\renewcommand*{\dtlsetlccharcode}[2]{%
  \ifboolexpr
  {%
    test {\ifstrequal{#1}{é}}
    or test {\ifstrequal{#1}{É}}
  }%
  {%
    #2=`e\relax
  }%
  {%
    #2=\lccode`#1\relax
  }%
}

```

(Extra conditionals will need to be added for other diacritics. Alternative conditionals, such as `\ifx` or `\ifnum`, may be more efficient. In the above I've used the `etoolbox` commands for clarity.)

There are two shortcut commands for `\dtlsort`:

`\DTLsort`

```
\DTLsort[<replacement key list>]{<sort criteria>}{<db name>}
```

`\DTLsort*`

```
\DTLsort*[<replacement key list>]{<sort criteria>}{<db name>}
```

these use the `\dtlcompare` and `\dtlicompare` handlers, respectively.

The optional argument *<replacement key list>* is a list of keys to use if the current key given in *<sort criteria>* is null for a given entry. Null keys are unlikely to occur if you have loaded the database from an external ASCII file, but may occur if the database is created using `\DTLnewdb`, `\DTLnewrow` and `\DTLnewdbentry`. For example:

```
\DTLsort[Editor,Organization]{Author}{mydata}
```

will sort according to the `Author` key, but if that key is missing for a given row of the database, the `Editor` key will be used, and if the `Editor` key is missing, it will use the `Organization` key. Note that this is not the same as:

```
\DTLsort{Author,Editor,Organization}{mydata}
```

which will first compare the `Author` keys, but if the author names are the same, it will then compare the `Editor` keys, and if the editor names are also the same, it will then compare the `Organization` keys.

The unstarred version uses a case sensitive comparison for strings, whereas the starred version ignores the case when comparing strings. Note that the case sensitive comparison orders uppercase characters before lowercase characters, so the letter `B` is considered to be lower than the letter `a`.

Example 18 (Sorting a Database)

This example uses the database called `scores` defined in [example 3](#). First, I am going to sort the database according to the student scores in descending order (highest to lowest) and display the database in a table

```
\begin{table}[htbp]
\caption{Student scores (sorted by score)}
\centering
\DTLsort{Score=descending}{scores}%
\begin{tabular}{llr}
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%)%
\DTLforeach{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\\
\firstname & \surname & \score}
\end{tabular}
\end{table}
```

This produces [Table 6.21](#).

Table 6.21: Student scores (sorted by score)

First Name	Surname	Score (%)
Jane	Brown	75
John	Smith, Jr	68
Roger	Brady	58
Zöe	Adams	52
Clare	Verdon	45
Andy	Brown	42

Now I am going to sort the database according to surname and then first name, and display it in a table. Note that since I want to sort in ascending order, I can omit the

=ascending part of the sort criteria. I have also decided to reverse the first and second columns, so that the surname is in the first column.

```
\begin{table}[htbp]
\caption{Student scores (sorted by name)}
\centering
\DTLsort{Surname,FirstName}{scores}%
\begin{tabular}{llr}
\bfseries Surname &
\bfseries First Name &
\bfseries Score (\%)%
\DTLforeach{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\\
\surname & \firstname & \score}
\end{tabular}
\end{table}
```

This produces [Table 6.22](#).

Table 6.22: Student scores (sorted by name)

Surname	First Name	Score (%)
Adams	Zöe	52
Brady	Roger	58
Brown	Andy	42
Brown	Jane	75
Smith, Jr	John	68
Verdon	Clare	45

Now suppose I add two new students to the database:

```
\DTLnewrow{scores}%
\DTLnewdbentry{scores}{Surname}{van der Mere}%
\DTLnewdbentry{scores}{FirstName}{Henk}%
\DTLnewdbentry{scores}{Score}{71}%
\DTLnewrow{scores}%
\DTLnewdbentry{scores}{Surname}{de la Mere}%
\DTLnewdbentry{scores}{FirstName}{Jos}%
\DTLnewdbentry{scores}{Score}{58}%
```

and again I try sorting the database, and displaying the contents as a table:

```
\begin{table}[htbp]
\caption{Student scores (case sensitive sort)}
\centering
\DTLsort{Surname,FirstName}{scores}%
\begin{tabular}{llr}
\bfseries Surname &
\bfseries First Name &
\bfseries Score (\%)%
\DTLforeach{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\\
\surname & \firstname & \score}
\end{tabular}
\end{table}
```

```

\bfseries Score (\%)%
\DTLforeach{scores}{%
\firstname=FirstName,\surname=Surname,\score=Score}{%
\\
\surname & \firstname & \score}
\end{tabular}
\end{table}

```

This produces [Table 6.23](#). Notice that the surnames aren't correctly ordered. This is because a case-sensitive sort was used. Changing `\DTLsort` to `\DTLsort*` in the above code produces [Table 6.24](#).

Table 6.23: Student scores (case sensitive sort)

Surname	First Name	Score (%)
Adams	Zöe	52
Brady	Roger	58
Brown	Andy	42
Brown	Jane	75
Smith, Jr	John	68
Verdon	Clare	45
de la Mere	Jos	58
van der Mere	Henk	71

Table 6.24: Student scores (case ignored when sorting)

Surname	First Name	Score (%)
Adams	Zöe	52
Brady	Roger	58
Brown	Andy	42
Brown	Jane	75
de la Mere	Jos	58
Smith, Jr	John	68
van der Mere	Henk	71
Verdon	Clare	45

Example 19 (Influencing the sort order)

Consider the data displayed in [Table 6.24](#), suppose that you want the names “van der Mere” and “de la Mere” sorted according to the actual surname “Mere” rather than by the “von part”. There are two ways you can do this: firstly, you could store the

von part in a separate field, and then sort by surname, then von part, then first name, or you could define a command called, say, `\switchargs`, as follows:

```
\newcommand*{\switchargs}[2]{#2#1}
```

then store the data as:

```
FirstName, Surname, StudentNo, Score
John, "Smith, Jr", 102689, 68
Jane, Brown, 102647, 75
Andy, Brown, 103569, 42
Z\ "oe, Adams, 105987, 52
Roger, Brady, 106872, 58
Clare, Verdon, 104356, 45
Henk, \switchargs{Mere}{van der }, 106789, 71
Jos, \switchargs{Mere}{de la }, 104256, 58
```

Now sort the data, and put it in table (this is the same code as in the previous example):

```
\begin{table}[htbp]
\caption{Student scores (influencing the sort order)}
\centering
\DTLsort*{Surname, FirstName}{scores}%
\begin{tabular}{llr}
\bfseries Surname & & \\
\bfseries First Name & & \\
\bfseries Score (\%) & & \\
\DTLforeach{scores}{%
\firstname=FirstName, \surname=Surname, \score=Score}{%
\\
\surname & \firstname & \score}
\end{tabular}
\end{table}
```

This produces [Table 6.25](#).

Table 6.25: Student scores (influencing the sort order)

Surname	First Name	Score (%)
de la Mere	Jos	58
van der Mere	Henk	71
Adams	Zöe	52
Brady	Roger	58
Brown	Andy	42
Brown	Jane	75
Smith, Jr	John	68
Verdon	Clare	45

6.9 Saving a Database to an External File

`\DTLsavedb`

```
\DTLsavedb{<db name>}{<filename>}
```

This writes the database called `<db name>` to a file called `<filename>`. The separator and delimiter characters used are as given by `\DTLsetseparator` (or `\DTLsettabseparator`) and `\DTLsetdelimiter`. For example:

```
\DTLsettabdelimiter  
\DTLsavedb{scores}{scores.txt}
```

will create a file called `scores.txt` and will save the data in a tab separated format. (The delimiters will only be used if a given entry contains the separator character.)

`\DTLsavetexdb`

```
\DTLsavetexdb{<db name>}{<filename>}
```

This writes the database called `<db name>` to a `LATEX` file called `<filename>`, where the database is stored as a combination of `\DTLnewdb`, `\DTLnewrow` and `\DTLnewdbentry` commands. This means that the file is in a user-friendly format, but may be so to load, particularly if the database is large. If you are more concerned with speed rather than readability you can use:

`\DTLsaverawdb`

```
\DTLsaverawdb{<db name>}{<filename>}
```

This saves the database to `<filename>` in its internal representation, which makes it faster to load. Fragile commands cause a problem for `\DTLsaverawdb` so if your database contains any use:

`\DTLprotectedsaverawdb`

```
\DTLprotectedsaverawdb{<db name>}{<filename>}
```

instead. The `datatooltk` application can read and write this raw format. To load a file in this format you can just use `\input` or you can use:

```
\DTLloaddbtex{<cs>}{<file>}
```

This checks for the file's existence and assigns the database name to the control sequence `<cs>`.

Databases saved using `\DTLsavetexdb`, `\DTLsaverawdb` and `\DTLprotectedsaveawdb` can be loaded using L^AT_EX's standard `\input` command. As from version 2.15, the last line of the database file defines

`\dtllastloadeddb`

```
\dtllastloadeddb
```

to the name of the database, in case it's required.

Databases saved using `\DTLsaverawdb` and `\DTLprotectedsaveawdb` can also be loaded and edited by `datatooltk` (see page 41).

6.10 Deleting or Clearing a Database

A database can be cleared or deleted when its contents are no longer required.

`\DTLcleardb`

```
\DTLcleardb{<db name>}
```

`\DTLgcleardb`

```
\DTLgcleardb{<db name>}
```

Clears the database given by `<db name>`. The database is emptied but remains defined. The second form is required if you want a global effect.

`\DTLdeletedb`

```
\DTLdeletedb{<db name>}
```

`\DTLgdeletedb`

```
\DTLgdeletedb{<db name>}
```

Deletes (undefines) the database given by `<db name>`. The second form is required if you want a global effect.

Although `\DTLdeletedb` and `\DTLgdeletedb` undefine the macros associated with the database, they don't unassign the registers used. (T_EX doesn't provide a command that performs the reverse of commands such as `\newcount`.) If you want to keep making temporary databases, it's better to just define a single database (called, say, `temp`) and then just clear it rather than delete it and define a new database. For example, if you are iterating through a loop and want to have a temporary database on each iteration. In that case, define the database before the start of the loop and clear it on each iteration. If you are loading data from an external file, remember to use `\DTLnewdbonloadfalse` before `\DTLloaddb` (or `\DTLloadrawdb`).

6.11 Advanced Database Commands

This section describes more advanced commands. Further details can be found in the documented code (`datatool-code.pdf`).

`\DTLgetdatatype`

```
\DTLgetdatatype{<cs>}{<db>}{<key>}
```

Gets the data type for the given key *<key>* for the database given by *<db>*. The data type is stored in *<cs>* which must be a command name. The type will be one of:

- `\DTLunsettype` • `\DTLunsettype` (not set),
- `\DTLstringtype` • `\DTLstringtype` (string),
- `\DTLinttype` • `\DTLinttype` (integer),
- `\DTLrealtype` • `\DTLrealtype` (real number) or
- `\DTLcurrencytype` • `\DTLcurrenttype` (currency).

`\DTLifdbexists`

```
\DTLifdbexists{<db name>}{<true part>}{<false part>}
```

Determines if the database given by *<db name>* exists.

`\DTLifhaskey`

```
\DTLifhaskey{<db name>}{<key>}{<true part>}{<false part>}
```

This determines if the database given by *<db name>* has any entries with the key given by *<key>*. If so, it does *<true part>* otherwise it does *<false part>*.

Each key has an associated column index. This can be obtained using:

`\DTLgetcolumnindex`

```
\DTLgetcolumnindex{<cs>}{<db>}{<key>}
```

where `<cs>` is a command name, `<db>` is the database label and `<key>` is the key. The column index is stored in `<cs>`.

You can also do the reverse and find the key associated with a given column index:

`\DTLgetkeyforcolumn`

```
\DTLgetkeyforcolumn{<key cs>}{<db>}{<column index>}
```

The key is stored in `<key cs>` (which must be a command name).

There is also a full expandable way of obtaining the column index, but note that no check is performed to determine if the database exists, or if it contains the given key:

`\dtlcolumnindex`

```
\dtlcolumnindex{<db name>}{<key>}
```

`\DTLgetkeydata`

```
\DTLgetkeydata{<key>}{<db>}{<col cs>}{<type cs>}{<header cs>}
```

Gets data for given key in database `<db>`: the column index is stored in `<col cs>` (as `\DTLgetcolumnindex`), the type is stored in `<type cs>` (as `\DTLgetdatatype`) and the header is stored in `<header cs>`.

`\DTLgetvalue`

```
\DTLgetvalue{<cs>}{<db>}{<r>}{<c>}
```

This gets the value for row given by index `<r>` and column given by `<c>` for the database `<db>` and stores it in `<cs>` which must be a command name. If you want to get the value by key rather than column index you can use `\dtlcolumnindex`. For example, the following gets the value for row 3 with key Surname from the database data and stores in `\myval`:

```
\DTLgetvalue{\myval}{data}{3}{\dtlcolumnindex{data}{Surname}}
```

`\DTLgetlocation`

```
\DTLgetlocation{<row cs>}{<column cs>}{<database>}{<value>}
```

Assigns `<row cs>` and `<column cs>` to the indices of the first entry in `<database>` that matches `<value>`.

`\DTLgetvalueforkey`

```
\DTLgetvalueforkey{<cmd>}{<key>}{<db name>}{<ref key>}{<ref value>}
```

This (globally) sets *<cmd>* (a control sequence) to the value of the key specified by *<key>* in the first row of the database called *<db name>* which contains the key *<ref key>* which has the value *<value>*.

\DTLfetch

```
\DTLfetch{<db name>}{<column1 name>}{<column1 value>}{<column2 name>}
```

This fetches and displays the value for *<column2 name>* in the first row where the value of *<column1 name>* is *<column1 value>*. (Note that all arguments are expanded.) So, for example, if you have a column labelled “regnum” and a column labelled “tutor”, then to fetch and display the value of the tutor in the row where “regnum” is “12345” from the database called “students” you can do:

```
\DTLfetch{students}{regnum}{12345}{tutor}
```

See [example 21](#) on page 103.

\DTLassign

```
\DTLassign{<db name>}{<row idx>}{<assign list>}
```

This (globally) assigns the list of commands in *<assign list>* for row *<row idx>* in database *<db name>*, where *<assign list>* has the same format as in `\DTLforeach`.

```
\DTLassignfirstmatch{<db name>}{<col key>}{<value>}{<assign list>}
```

This is similar to `\DTLassign` except that it applies to the first row in the given database where the column identified by the label *<col key>* has the given value. Note that no expansion is performed in the match. The value must be an exact match.

```
\xDTLassignfirstmatch{<db name>}{<col key>}{<value>}{<assign list>}
```

This is like `\DTLassignfirstmatch` but performs a *one-level* expansion on *<value>*.
Two rows can be swapped using:

\DTLswaprows

```
\DTLswaprows{<db name>}{<row1 index>}{<row2 index>}
```

where $\langle row1\ index\rangle$ and $\langle row2\ index\rangle$ are the indices of the rows to be swapped. For example:

```
\DTLswaprows{scores}{3}{5}
```

will swap the third and fifth rows.

Example 20 (Two Database Rows Per Tabular Row (Column-Wise))

This example adapts [example 9](#) so that the list is ordered vertically rather than horizontally.

```
\begin{table}[htbp]
\caption{Two database rows per tabular row (column-wise)}
\centering
% store half number of rows
\edef\maxrows{\DTLrowcount{scores}}%
\DTLdiv{\halfrowidx}{\maxrows}{2}
\begin{tabular}{llc}
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%) &
\bfseries First Name &
\bfseries Surname &
\bfseries Score (\%)%
\DTLforeach*[\value{DTLrowi}<\halfrowidx]{scores}%
{\\firstname=FirstName,\surname=Surname,\score=Score}%
{%
\\%
\firstname & \surname & \score
&
\edef\currentrowidx{\arabic{DTLrowi}}%
\DTLadd{\rowidxII}{\halfrowidx}{\currentrowidx}%
\DTLassign{scores}{\rowidxII}%
{\\firstnameII=FirstName,\surnameII=Surname,\scoreII=Score}%
\firstnameII & \surnameII & \scoreII
}%
\end{tabular}
\end{table}
```

This produces [Table 6.26](#).

Table 6.26: Two database rows per tabular row (column-wise)

First Name	Surname	Score (%)	First Name	Surname	Score (%)
Zöe	Adams	52	Jos	de la Mere	58
Roger	Brady	58	John	Smith, Jr	68
Andy	Brown	42	Henk	van der Mere	71
Jane	Brown	75	Clare	Verdon	45

6.11.1 Operating on Current Row

If you want to select from or edit a particular row in a database without having to iterate through the database using `\DTLforeach`, you can use the commands described in this section. Remember that the row index is a reference to the internal data and is unrelated to references in the original source (such as line numbers in a CSV file).

`\DTLgetrowindex`

```
\DTLgetrowindex{<row cs>}{<db name>}{<col idx>}{<value>}
```

Gets the row index of the first row in database `<db name>` where the value for column `<col idx>` matches `<value>` and stores the result in `<row cs>`, which must be a control sequence. An error message is given if not found.

`\dtlgetrowindex`

```
\dtlgetrowindex{<row cs>}{<db name>}{<col idx>}{<value>}
```

Similar to `\DTLgetrowindex` but doesn't produce an error if no match is found. You can test the result by using `\ifx<row cs>\dtlnovalue`. For example:

```
\dtlgetrowindex{\myrowidx}{data}{\dtlcolumnindex{data}{Surname}}{Smith}
\ifx\myrowidx\dtlnovalue
  Not Found
\else
  Found in row \myrowidx.
\fi
```

If you want `<value>` to be fully expanded before testing you can use

`\xdtlgetrowindex`

```
\xdtlgetrowindex{<row cs>}{<db name>}{<col idx>}{<value>}
```

(The `etoolbox` package provides `\expandonce` if you only want one level of expansion. See the `etoolbox` manual for further details.)

`\dtlgetrow`

```
\dtlgetrow{<db name>}{<row idx>}
```

Gets the row with index `<row idx>` from the database `<db name>`. The required row is stored in the token register

`\dtlcurrentrow`

```
\dtlcurrentrow
```

the preceding rows are stored in the token register

`\dtlbeforerow`

```
\dtlbeforerow
```

the following rows are stored in the token register

`\dtlafterrow`

```
\dtlafterrow
```

the row index, *<row idx>*, is stored in the register

`\dtlrownum`

```
\dtlrownum
```

and the database name is stored in the control sequence

`\dtldbname`

```
\dtldbname
```

No check is made in `\dtlgetrow` to see if the database exists or if the row index is valid. You will probably get a “Missing { inserted” error if you misspell the database name and a “Runaway argument” error if you specify a row index that is out of range.

`\dtlgetrowforvalue`

```
\dtlgetrowforvalue{<db name>}{<column index>}{<value>}
```

Like `\dtlgetrow`, but this gets the row where the entry in column *<column index>* matches *<value>*. This command produces an error if no match is found. **Note that no expansion is performed when matching *<value>***. If you want *<value>* expanded before comparison, use:

`\edtlgetrowforvalue`

```
\edtlgetrowforvalue{<db name>}{<column index>}{<value>}
```

You can use the commands below to access or edit `\dtlcurrentrow`, but they won’t change the database. Instead, once you’ve finished editing `\dtlcurrentrow`, you need to reconstruct the database token by recombining `\dtlbeforerow`, `\dtlcurrentrow` and `\dtlafterrow` using:

`\dtlrecombine`

```
\dtlrecombine
```

Alternatively, to recombine omitting the current row:

`\dtlrecombineomitcurrent`

```
\dtlrecombineomitcurrent
```

(This removes the current row from the database, shifting the row indices in `\dtlafterrow`.) Note that these recombining commands assume that you haven't altered `\dtlrownum`, `\dtldbname`, `\dtlbeforerow` and `\dtlafterrow`.

`\dtlcurrentrow` stores the row information using datatool's internal row syntax, described in the documented code (`datatool-code.pdf`). Don't explicitly modify `\dtlcurrentrow` unless you have a good understanding of the syntax.

`\dtlgetentryfromcurrentrow`

```
\dtlgetentryfromcurrentrow{<cs>}{<col idx>}
```

Gets the value from `\dtlcurrentrow` for the column given by `<col idx>` (an integer) and stores in `<cs>`, which must be a control sequence.

`\dtlreplaceentryincurrentrow`

```
\dtlreplaceentryincurrentrow{<new value>}{<col idx>}
```

Replaces the value in `\dtlcurrentrow` for the column given by `<col idx>` (an integer) with `<new value>`.

The new value doesn't get expanded.

`\dtlremoveentryincurrentrow`

```
\dtlremoveentryincurrentrow{<col idx>}
```

Removes the value in `\dtlcurrentrow` for the column given by `<col idx>`.

`\dtlswapentriesincurrentrow`

```
\dtlswapentriesincurrentrow{<col1 idx>}{<col2 idx>}
```

Swaps entries in columns `<col1 idx>` and `<col2 idx>` in `\dtlcurrentrow` (where `<col1 idx>` and `<col2 idx>` are the column indices).

`\dtlappendentrytocurrentrow`

```
\dtlappendentrytocurrentrow{<key>}{<value>}
```

Appends `<value>` to the current row for column given by `<key>`. (Produces an error if there is already an entry for that column in the current row.)

`\dtlupdateentryincurrentrow`

```
\dtlupdateentryincurrentrow{<key>}{<value>}
```

Behaves like `\dtlappendentrytocurrentrow` if the current row doesn't contain an entry for the column given by `<key>`, otherwise behaves like `\dtlreplaceentryincurrentrow`.

Example 21 (Joining Two Databases in a Single Table)

Suppose a lecturer has a CSV file for a particular course that contains student registration numbers and marks for the Autumn and Spring semesters. The file is called, say, `cmp101.csv` and contains the following:

```
regnum, Autumn Marks, Spring Marks
12345, 80, 85
12346, 70, 90
12347, 75, 60
```

This only contains the student registration numbers, not their names, but suppose there's another CSV file that contains the registration numbers and names for all students at the department (or university). This file called, say, `students.csv` may look something like:

```
regnum, name
12344, Mary Brown
12345, Joe Bloggs
12346, Jane Doe
12347, John Smith
12348, Alice Jones
```

Now suppose the lecturer wants a table of all the students on course CMP101 listing each student's name and marks. Here's the code:

```
\DTLloadadb{cmp101}{cmp101.csv}% load course data
\DTLloadadb{students}{students.csv}% load student data

\begin{table}[htbp]
  \caption{Student Marks (Joining Databases)}
  \centering
  \begin{tabular}{lrr}
    \bfseries Name & \bfseries Autumn Marks & \bfseries Spring Marks%
    \DTLforeach*{cmp101}%
    {\RegNum=regnum, \Autumn=Autumn Marks, \Spring=Spring Marks}%
    {\DTLfetch{students}{regnum}{\RegNum}{name} & \Autumn & \Spring}%
  \end{tabular}
\end{table}
```

The result is shown in [Table 6.27](#).

Table 6.27: Student Marks (Joining Databases)

Name	Autumn Marks	Spring Marks
Joe Bloggs	80	85
Jane Doe	70	90
John Smith	75	60

Let's suppose now that the `students.csv` file has the first name and surname in separate columns rather than single columns. So the CSV file looks like:

```
regnum, forename, surname
12344, Mary, Brown
12345, Joe, Bloggs
12346, Jane, Doe
12347, John, Smith
12348, Alice, Jones
```

You may be tempted to replace

```
\DTLfetch{students}{regnum}{\RegNum}{name}
```

with

```
\DTLfetch{students}{regnum}{\RegNum}{forename} \space
\DTLfetch{students}{regnum}{\RegNum}{surname}
```

in the above code, but this is inefficient as it requires two searches for the same row. Instead, you can do:

```
\DTLfetch{students}{regnum}{\RegNum}{forename} \space
\dtlgetentryfromcurrentrow{\Surname}{\dtlcolumnindex{students}{surname}}%
\Surname
```

This can be done because

```
\DTLfetch{students}{regnum}{\RegNum}{forename}
```

is equivalent to

```
\edtlgetrowforvalue{students}{\dtlcolumnindex{students}{regnum}}{\RegNum}%
\dtlgetentryfromcurrentrow
{\dtlcurrentvalue}{\dtlcolumnindex{students}{forename}}%
\dtlcurrentvalue
```

This means that `\dtlcurrentrow` has already been set by `\DTLfetch` so we can just do another `\dtlgetentryfromcurrentrow` for the surname field. The new code for the table is now:


```

\DTLloaddb{cmp101}{cmp101.csv}% load course data
\DTLloaddb{students}{students.csv}% load student data

\begin{table}[htbp]
\caption{Student Marks (Joining Databases)}
\centering
\begin{tabular}{lrr}
\bfseries Name & \bfseries Autumn Marks & \bfseries Spring Marks%
\DTLforeach*{cmp101}%
{\RegNum=regnum,\Autumn=Autumn Marks,\Spring=Spring Marks}%
{\%
\DTLfetch{students}{regnum}{\RegNum}{forename}\space
\dtlgetentryfromcurrentrow{\Surname}{\dtlcolumnindex{students}{surname}}%
\Surname
& \Autumn & \Spring}%
\end{tabular}
\end{table}

```

The result is shown in [Table 6.28](#).

Table 6.28: Student Marks (Joining Databases)

Name	Autumn Marks	Spring Marks
Joe Bloggs	80	85
Jane Doe	70	90
John Smith	75	60

Caveat: be careful of scoping issues. Suppose you want the first name and surname in separate columns, you may consider doing:

```

\DTLfetch{students}{regnum}{\RegNum}{forename}%
&
\dtlgetentryfromcurrentrow{\Surname}{\dtlcolumnindex{students}{surname}}%
\Surname

```

(and adding an extra column to the tabular environment). However this will result in undefined values for `\Surname` as `\dtlcurrentrow` is only locally set. After the `&` special character `\dtlcurrentrow` has lost its value as it's no longer in the same scope. You can fix this problem in a number of ways. Firstly you can make `\dtlcurrentrow` global after `\DTLfetch` via

```
\global\dtlcurrentrow=\dtlcurrentrow
```

or you could move the column break to just before `\Surname` and make `\Surname` global:

```

\DTLfetch{students}{regnum}{\RegNum}{forename}%
\dtlgetentryfromcurrentrow{\Surname}{\dtlcolumnindex{students}{surname}}%
\global\let\Surname\Surname
&
\Surname

```

There are other possibilities as well, but the first method is probably the best, especially if you have multiple columns you want to fetch.

Here's the updated code:

```
\begin{table}[htbp]
\caption{Student Marks (Joining Databases)}
\centering
\begin{tabular}{llrr}
\bfseries Forename & \bfseries Surname &
\bfseries Autumn Marks & \bfseries Spring Marks%
\DTLforeach*{cmp101}%
{\RegNum=regnum,\Autumn=Autumn Marks,\Spring=Spring Marks}%
{\%
\DTLfetch{students}{regnum}{\RegNum}{forename}%
\global\dtlcurrentrow=\dtlcurrentrow
&
\dtlgetentryfromcurrentrow{\Surname}{\dtlcolumnindex{students}{surname}}%
\Surname
& \Autumn & \Spring}%
\end{tabular}
\end{table}
```

The result is shown in [Table 6.29](#).

Table 6.29: Student Marks (Joining Databases)

Forename	Surname	Autumn Marks	Spring Marks
Joe	Bloggs	80	85
Jane	Doe	70	90
John	Smith	75	60

6.11.2 Advanced Iteration

The `\DTLforeach` command described in Section 6.4 has some limitations, especially when trying to iterate through large databases. This section describes lower-level user commands that may be used for iteration instead of `\DTLforeach`.

`\dtlforeachkey`

```
\dtlforeachkey(<key cs>,<col cs>,<type cs>,<header cs>)\in
{<db>}\do{<body>}
```

This iterates through all the keys in the database given by `<db>`. In each iteration, `<key cs>` is set to the key, `<col cs>` is set to the column index, `<type cs>` is set to the data type (as for `\DTLgetdatatype`), `<header cs>` is set to the header for that column, and then

$\langle body \rangle$ is done. Note that $\langle key cs \rangle$, $\langle col cs \rangle$, $\langle type cs \rangle$ and $\langle header cs \rangle$ must all be control sequences. No check is performed to determine if that control sequence already exists, and the control sequences are defined globally (since it's likely that `\dtlforeachkey` may be used within a tabular environment), so you need to make sure you don't override an existing command of the same name.

`\dtlforeachcolumn`

```
\dtlforeachcolumn{\langle cs \rangle}{\langle db \rangle}{\langle key \rangle}{\langle body \rangle}
```

This iterates through the column given by $\langle key \rangle$ in the database given by $\langle db \rangle$ and applies $\langle body \rangle$. In each iteration, $\langle cs \rangle$ (which must be a control sequence) is set to the current element in the column and may be used in $\langle body \rangle$. Alternatively, if you want to identify the column by its index rather than its key, use:

`\dtlforeachcolumnidx`

```
\dtlforeachcolumnidx{\langle cs \rangle}{\langle db \rangle}{\langle col index \rangle}{\langle body \rangle}
```

Both `\dtlforeachcolumn` and `\dtlforeachcolumnidx` have a starred version that doesn't check for the existence of the given database. You may use `\dtlbreak` within $\langle body \rangle$ to break out of the loop at the end of the current iteration.

An alternative to `\DTLforeach` is to use TeX's primitive `\loop` with `\DTLgetvalue`, but this may not be faster. For example, suppose I have a CSV file with a single column (labelled "Word") with 1000 rows of data (where the CSV file is called `test-data-1000.csv`). First, let's use the unstarred version of `\DTLforeach`:

```
\batchmode
\documentclass{article}
\usepackage{datatool}

\DTLloaddb{data}{test-data-1000.csv}

\begin{document}
\DTLforeach{data}{\Word=Word}{\Word.\par}
\end{document}
```

On my 64bit Linux computer, this document took 4.942s to compile. Result from `time pdflatex test`:

```
real 0m4.942s
user 0m4.934s
sys 0m0.015s
```

Now using the starred version of `\DTLforeach`:

```
\batchmode
\documentclass{article}
```

```

\usepackage{datatool}

\DTLloaddb{data}{test-data-1000.csv}

\begin{document}
\DTLforeach*{data}{\Word=Word}{\Word.\par}
\end{document}

```

This took 2.138s to compile:

```

real 0m2.138s
user 0m2.122s
sys 0m0.020s

```

Now using TeX's `\loop`:

```

\batchmode
\documentclass{article}
\usepackage{datatool}

\DTLloaddb{data}{test-data-1000.csv}

\begin{document}

\newcount\rowctr
\loop
  \advance\rowctr by 1\relax
  \DTLgetvalue{\Word}{data}{\rowctr}{1}%
  \Word.\par
\ifnum\rowctr<\DTLrowcount{data}
\repeat

\end{document}

```

(This takes advantage of the fact that I know I only have one column of data, so I only need to reference column 1 in `\DTLgetvalue`.) This takes 2.638s to compile:

```

real 0m2.638s
user 0m2.622s
sys 0m0.020s

```

which is slightly longer than using `\DTLforeach*` (but not nearly as long as using the unstarred version). Another possible method is to use `\dtlgetrow` and `\dtlgetentryfromcurrentrow`:

```

\batchmode
\documentclass{article}
\usepackage{datatool}

\DTLloaddb{data}{test-data-1000.csv}

```

```

\begin{document}

\newcount\rowctr
\loop
  \advance\rowctr by 1\relax
  \dtlgetrow{data}{\rowctr}%
  \dtlgetentryfromcurrentrow{\Word}{1}%
  \Word.\par
\ifnum\rowctr<\DTLrowcount{data}
\repeat

\end{document}

```

This took 3.596s to compile:

```

real 0m3.596s
user 0m3.582s
sys 0m0.019s

```

Another possibility is to use `\dtlforcolumidx`, described above:

```

\batchmode
\documentclass{article}
\usepackage{datatool}

\DTLloaddb{data}{test-data-1000.csv}

\begin{document}

\dtlforcolumidx{\Word}{data}{1}{\Word.\par}

\end{document}

```

This took 2.093s to compile:

```

real 0m2.093s
user 0m2.083s
sys 0m0.013s

```

So if you only want to iterate through one column, this is the fastest method, but it's still more efficient to pre-process the data using an external script that creates a `.tex` file that can be `\input` into the document.

Note that the build time increases with extra columns, *even if they're not required in the document*. For example, I created a new CSV file called `test-data-1000-5.csv` that had four extra columns (which were actually duplicates of the first column with different headers, for simplicity). Just iterating through the first column to obtain the same PDF as previously significantly increases the time taken. The only modification to the above examples was an edit to the `\DTLloaddb` line:

```

\DTLloaddb{data}{test-data-1000-5.csv}

```

The fastest method using `\dtlforcolumndx` took 25.688s:

```
real 0m25.688s
user 0m25.712s
sys 0m0.013s
```

Using `\DTLforeach*` took 25.725s:

```
real 0m25.725s
user 0m25.744s
sys 0m0.018s
```

The unstarred version took 35.665s:

```
real 0m35.665s
user 0m35.692s
sys 0m0.022s
```

Using `\loop` and `\DTLgetvalue` took 27.844s:

```
real 0m27.844s
user 0m27.866s
sys 0m0.019s
```

Using `\loop` and `\dtlgetrow` took 31.770s:

```
real 0m31.770s
user 0m31.785s
sys 0m0.028s
```

On the other hand, if I want to only iterate through, say, the last 100 rows of the data, it's simpler to use `\loop`. For example:

```
\batchmode
\documentclass{article}

\usepackage{datatool}

\DTLloaddb{data}{test-data-1000-5.csv}

\begin{document}
\newcount\rowctr
\rowctr=\numexpr\DTLrowcount{data}-100\relax
\loop
\advance\rowctr by 1\relax
\DTLgetvalue{\Word}{data}{\rowctr}{1}%
\Word.\par
\ifnum\rowctr<\DTLrowcount{data}
\repeat
\end{document}
```

This took 25.124s:

```
real 0m25.124s
user 0m25.138s
sys 0m0.023s
```

The equivalent using `\DTLforeach` is:

```
\batchmode
\documentclass{article}

\usepackage{datatool}

\DTLloaddb{data}{test-data-1000-5.csv}

\begin{document}
\newcount\firstidx
\firstidx=\numexpr\DTLrowcount{data}-100\relax
\DTLforeach*{data}{\Word=Word}%
  {\ifnum\DTLcurrentindex>\firstidx\relax\Word.\par\fi}
\end{document}
```

(Remember that the row count can't be used in the optional argument of `\DTLforeach` as it's only incremented when the condition is true.) This took 26.375s:

```
real 0m26.375s
user 0m26.381s
sys 0m0.029s
```

This takes longer because it's still iterating over every row of the database and is applying the condition to each row.

Summary

- If possible, use an external script to pre-process the data so that you can simply `\input` valid \LaTeX code into the document.
- If you only want to iterate through one column of the data, use `\dtlforcolumnidx`.
- Remove⁴ unwanted columns and/or rows from the CSV file (and sort, if necessary) using the spreadsheet application (or whatever) that was used to generate the original CSV file.

⁴Naturally, make a copy of the original data, if necessary.

7 Creating an index, glossary or list of acronyms (datagidx package)

The datagidx package is provided as an alternative to the glossaries package. Rather than relying on an external indexing application, such as `xindy` or `makeindex`, it uses the database mechanism of the datatool package. *datagidx and glossaries are not compatible.* (Note: glossaries version 4.04 now has an option that uses \TeX to sort the glossaries instead of using `makeindex` or `xindy`.)

First a repeat of the caveat at the start of this manual:

Use the right tool for the right job.

Don't expect datagidx to perform as efficiently as an application that is designed specifically to sort and collate entries.

If, however, you are happy to exchange efficiency for the convenience of not having to invoke an external application in between \LaTeX runs, read on.

Sections 7.1 and 7.3 describe how to create and populate a database that's used to store terms or acronyms. By default the database is sorted when it's displayed using `\printterms` (see section 7.8). This is where the main inefficiency lies in this package. A faster alternative is to use `datatooltk` (see page 41) and its `datagidx` plugin, which will allow you to enter terms in a graphical environment and sort the terms. This way, you only need to sort the database after you enter a new term and the sorting is done by a more efficient language than \TeX . Note that this means returning to using an external helper application, but it only needs to be used when you add a new term rather than between each pair of \LaTeX runs.

Once you've edited and sorted the database in `datatooltk`, you can then just load it using:

`\loadgidx`

```
\loadgidx[\langle options \rangle]{\langle filename \rangle}{\langle title \rangle}
```

where *\langle filename \rangle* is the name of the file saved in `datatooltk`. The remaining arguments *\langle options \rangle* and *\langle title \rangle* are the same as for `\newgidx`, described in section 7.1. This command automatically sets the default database to the loaded database. You can change the default database using `\DTLgidxSetDefaultDB`, described in section 7.3.

Since `\loadgidx` is intended for use with presorted databases, the sort key defaults to nothing.

If you've opted to use `datagidx` over glossaries because you don't want to install Perl, then don't bother with `datatooltk` because, although it's a Java application, it requires Perl for the plugins.

7.1 Defining Index/Glossary Databases

The databases and their associated entries described here can only be defined in the preamble. This is because the database must be set up before the auxiliary file is read. If you don't want to lose your place by constantly returning to the preamble to add a new term while you edit your document, consider putting all your definitions in a separate file which can be `\input` in the preamble. You can then switch between files without losing your place (provided you are using a decent text editor). Alternatively, use `datatooltk`'s `datagidx` plugin as described above.

First you need to define a customised database that will be used to store the entries in your index, glossary or list of acronyms:

`\newgidx`

```
\newgidx[<options>]{<label>}{<title>}
```

This defines a new database with a unique label and a title. For example:

```
\newgidx{index}{Index}
```

I can now identify this database using the label `index`. The title "Index" is the default heading when the database is displayed using `\printterms` (see [section 7.8](#)).

The optional argument *<options>* should be a key=value list. Available options:

showgroups Boolean option that indicates whether or not to insert group headings (and a group separator) between index groups, if headings are supported by the given style. If no value is supplied, true is assumed.

style The style to use. The value should be the name of the style. Available styles are listed in [subsection 7.8.1](#).

sort How to sort the database. See [subsection 7.8.2](#) for further details.

balance This is a boolean option that is only applied if `columns` is greater than 1. If true, the columns are balanced. If false, the columns aren't balanced. If no value is specified, true is assumed. If `balance=false` and `columns=2` `\twocolumn` is used instead of `multicols*`.

heading The heading at the start of the index/glossary.

postheading What to put immediately after the heading.

7.2 Locations

Each term in an index or glossary database has an associated location list. This is initially null. When you display the database using `\printterms` (see [section 7.8](#)) only those entries with a non-null location list or with a “see” cross-reference are displayed. The location by default is the page number on which the entry has been used. This may be changed to another counter by redefining

`\DTLgidxCOUNTER`

```
\DTLgidxCOUNTER
```

to the name of the required counter. For example:

```
\renewcommand*\DTLgidxCOUNTER{section}
```

The `datagidx` package knows about the following counter styles: `arabic`, `roman`, `Roman`, `alph` and `Alph`. If your location counter uses a different style, you will need to add a new location type. This will only work if the counter uses a command that expands to another command that takes a number as its argument. For example, suppose I want to use small caps Roman numeral page numbering. I need to define a command (say `\myscroman`) that takes a counter name as its argument but expands to another command that takes a number as its argument, like this:

```
\newcommand*\myscroman[1]{\myscromannum{\value{#1}}}  
\newcommand*\myscromannum[1]{\textsc{\romannumeral#1}}
```

Note that the font changing command `\textsc` is in the definition of `\myscromannum` not in the definition of `\myscroman`. The page counter can now be changed so that it uses `\myscroman`:

```
\renewcommand*\thepage{\myscroman{page}}
```

I now have to indicate that `\myscromannum` is a valid location type using:

`\DTLgidxAddLocationType`

```
\DTLgidxAddLocationType{<cs name>}
```

where `<cs name>` is the name of the control sequence without the initial backslash. Like this:

```
\DTLgidxAddLocationType{myscromannum}
```

Note that this is the command that takes a number as its argument (`\myscromannum`) not the command that takes a counter name as its argument (`\myscroman`).

As with `makeindex` and `xindy`, locations may have a compositor. The default compositor is a full stop but may be changed by redefining

`\DTLgidxSetCompositor`

```
\DTLgidxSetCompositor
```

Alternatively, you can use the package option `compositor`.

7.3 Defining Terms

Once you have defined the database, you can now define terms associated with that database using

```
\newterm
```

```
\newterm[<options>]{<name>}
```

where *<name>* is the term and *<options>* is a comma-separated list of *<key>=<value>* options. The following keys are available:

database Identifies the database in which to store this term. For example:

```
\newterm[database=index]{reptile}
```

It can be somewhat cumbersome having to keep typing the database for each new term. Instead you can identify the default database using

```
\DTLgidxSetDefaultDB
```

```
\DTLgidxSetDefaultDB{<label>}
```

Note: the argument *<label>* is not expanded.

Example:

```
% define two indexes:
\newgidx{index}{Index}
\newgidx{people}{People}
% Set "index" as the default database:
\DTLgidxSetDefaultDB{index}
% This batch of terms will be added to database "index":
\newterm{reptile}
\newterm{mammal}
\newterm{insect}
% Set "people" as the default database:
\DTLgidxSetDefaultDB{people}
% This batch of terms will be added to database "people":
\newterm{Bob}
\newterm{Mary}
\newterm{Jane}
```

- label** A unique identifying label. This should not contain any active characters. If omitted, the label is extracted from *<name>* (see below).
- sort** The sort key. If omitted, this is extracted from *<name>* (see below).
- parent** The parent entry, if this is a sub-term. An entry may only have one parent. If you want the same term to appear under two different parents, you'll have to define two separate terms with the same name but different parents (and different labels). This is the only way to avoid ambiguity with the hyperlinks (if enabled).
- text** How the entry should appear in the document text. This is *<name>* by default. If this option is used, *<name>* indicates how the entry should appear in the index, glossary or list of acronyms.
- description** An optional description. This is usually not required for an index but needed for a glossary.
- plural** The plural form of the term. If omitted this is formed by appending "s" to *<name>* (or the value of the text key if supplied).
- symbol** An associated symbol if required.
- short** An associated short form if required. (Default *<name>*.)
- long** An associated long form if required. (Default *<name>*.)
- shortplural** An associated short plural if required. (Default formed by appending "s" to the value of the short key.)
- longplural** An associated long plural if required. (Default formed by appending "s" to the value of the long key.)
- see** A cross-reference to a synonym. The value should be the label of another entry. This entry will not have a location list, just the reference to the other term.
- seealso** A cross-reference to a closely related term. This entry should have both a location list and a reference to the other term.

If the `or` key are omitted, `datagidx` tries to form sensible defaults. At the moment, this involves stripping certain commands (`\MakeUppercase`, `\MakeLowercase`, `\MakeTextUppercase`, `\MakeTextLowercase`, `\acronymfont`, `\textsc`, `\textbf`, `\textmd`, `\textit`, `\textsl`, `\textrm`, `\texttt`, `\textsf`, `\emph`, `\ensuremath` and `\textsuperscript`), stripping accents and replacing certain control characters or control sequences (`~` is replace with a space and `\&` is replaced with `\andname` (if defined) or "and" (if `\andname` isn't defined)). The Greek letter commands (`\alpha` etc) are converted to their name.

Examples:

1. `\ensuremath` is stripped and `\alpha` is converted to “alpha” so the following:

```
\newterm{\ensuremath{\alpha}}
```

sets both the label and sort to `alpha` but the name and text fields are set to `\ensuremath{\alpha}`.

2. Accent commands are stripped so the following:

```
\newterm{mac\`edoine}
```

sets both the label and sort fields to `macedoine` but the name and text fields are set to `mac\`edoine`.

The first letter must be grouped if it's an accent or ligature or a character outside the range a...z or A...Z.

3. This example must have the sort and label fields set manually because the first letter has an accent:

```
\newterm[label=elite,sort=elite]{\`elite}
```

4. The same applies if you are using the `inputenc` package:

```
\newterm[label=elite,sort=elite]{\`{e}lite}
```

5. The same applies to plural terms set explicitly:

```
\newterm
[%
  plural={{\o}sophagi},%
  label={oesophagus},%
  sort={oesophagus}%
]
{{\o}sophagus}
```

6. Commands such as `\oe` aren't dealt with, so you must manually set the label and sort key:

```
\newterm[label=manoeuvre,sort=manoeuvre]{man\oe uvre}
```

7. The same applies if you are using the `inputenc` package:

```
\newterm[label=manoeuvre,sort=manoeuvre]{man\oe uvre}
```

Take care if any of the values to fields contain a comma or equal sign. The value must be grouped.

8. This term contains a comma in some of the fields:

```
\newterm
[%
  label={comma},%
  sort={,},%
  text={comma (,)}%
  plural={commas (,)}%
]
{, (comma)}
```

In the text, the entry is `comma (,)` but in the index the entry is sorted according to the comma symbol and is displayed as `, (comma)`.

7.3.1 Commands to Assist Sorting

There are some situations where you will have to specify the sort key, for example:

```
\newterm
[
  sort={Ten Downing Street}
]
{10 Downing Street}
```

However, there are some commands provided to help set the default sort for entries that are sorted differently from the way they are typeset in the index/glossary, which can help reduce the number of times you need to explicitly set the sort field.

`\DTLgidxParen`

```
\DTLgidxParen{<text>}
```

This command is provided for parenthetical material that should be typeset in the index, but should not contribute to the sort unless there is an identical entry without parenthetical material.

For example:

```
\newterm{0\DTLgidxParen{zero}}
```

This term is typeset as `0 (zero)`, but has the sort and label fields set to `0`.

The default sort used is word-order sorting. This has a special number group for entries where the sort field consists solely of digits and they are sorted numerically rather than by string comparison. Using `\DTLgidxParen` in this manner, the following terms will appear in numerical order in the index:

```

\newterm{0\DTLgidxParen{zero}}
\newterm{1\DTLgidxParen{one}}
\newterm{2\DTLgidxParen{two}}
\newterm{3\DTLgidxParen{three}}
\newterm{10\DTLgidxParen{ten}}
\newterm{100\DTLgidxParen{one hundred}}
\newterm{20\DTLgidxParen{twenty}}

```

If `\DTLgidxParen` was not used and the parentheses were explicitly included, e.g. `0 (zero)`, then the entries would be placed in the symbol group instead and be sorted according to string (so `10 (ten)` would come before `2 (two)`).

`\DTLgidxPlace`

```
\DTLgidxPlace{\langle country/country\rangle}{\langle city/town\rangle}
```

Use this command to indicate a place. For example:

```
\newterm{\DTLgidxPlace{USA}{New York}}
```

This sets the label and name to `New York, USA`, the text field is set to just `New York` and the sort field is set to `New York\datatoolplacecomma USA` (see [section 6.8](#)).

`\DTLgidxSubject`

```
\DTLgidxSubject{\langle subject\rangle}{\langle text\rangle}
```

Use this to indicate a subject, concept or object. Example:

```
\newterm{\DTLgidxSubject{population}{New York}}
```

Both the label and name fields default to `New York, population`, the text field defaults to `population` and the sort field is set to `New York\datatoolsubjectcomma population` (see [section 6.8](#)).

`\DTLgidxName`

```
\DTLgidxName{\langle forename(s)\rangle}{\langle surname\rangle}
```

Use this command to index a person. The entry will be sorted according to the surname then the forenames. The entry will be displayed as `\langle surname\rangle, \langle forename(s)\rangle` in the index but will be displayed as `\langle forename(s)\rangle \langle surname\rangle` when referenced in the document. The label, on the other hand, is set to just the surname. Example:

```
\newterm{\DTLgidxName{Donald E.}{Knuth}}
```

This sets the name field to `Knuth, Donald E.`, the text field to `Donald E. Knuth`, the label to `Knuth` and the sort field to `Knuth\datatoolpersoncomma Donald E.` (see [section 6.8](#)).

A person's title (such as "Dr") should typically not affect the sort, unless there is another person with the same surname and forenames (or initials) without a title. To assist this, you can identify a person's title using:

`\DTLgidxRank`

```
\DTLgidxRank{<title>}{<forename(s)/initial(s)>}
```

Using examples from the Oxford Style Manual:

```
\newterm[label=AliceMeynell]{\DTLgidxName{Meynell}{Alice}}
\newterm[label=DrMeynell]{\DTLgidxName{Meynell}{\DTLgidxRank{Dr}{A.}}}
\newterm[label=AMeynell]{\DTLgidxName{Meynell}{A.}}
```

Here the labels must be set as the surnames are identical for each entry, but the entries will be sorted in the order: "Meynell, A.", "Meynell, Dr A." and "Meynell, Alice".

You can use

`\DTLgidxNameNum`

```
\DTLgidxNameNum{<number>}
```

to indicate a number associated with a name. The number is typeset as an uppercase Roman numeral in the text, but is sorted numerically.

For example:

```
\newterm{James~\DTLgidxNameNum{1}}
```

This is typeset as James~I, but gets the label James I (note no tilde) and the sort field is set to James 01. This means that if I want to index all the Kings whose name is James, they will appear in the correct order in the index.

If a term contains a variant of "Mac" you can also use:

`\DTLgidxMac`

```
\DTLgidxMac{<text>}
```

The entry will be typeset with *<text>* but the sort key will have *<text>* replaced with Mac. Examples:

```
\newterm{\DTLgidxName{Joe}{\DTLgidxMac{Mc}Cullers}}
\newterm{\DTLgidxName{Bob}{\DTLgidxMac{M'}Fingal}}
\newterm{\DTLgidxMac{Mc}Carthyism}
\newterm{\DTLgidxMac{Mc}Guffin}
```

Similarly saints can be identified using:

`\DTLgidxSaint`

```
\DTLgidxSaint{<text>}
```


Examples:

```
\newterm{\DTLgidxSaint{St} Julian}
\newterm{\DTLgidxName{Q.}{\DTLgidxSaint{St}~John-Smythe}}
\newterm{\DTLgidxPlace{\DTLgidxSaint{St}~Andrews}{Fife}}
```

These will be sorted according to Saint Julian, Saint John-Smythe\datatoolpersoncomma Q. and Saint Andrews\datatoolplacecomma Fife.

Particles, such as “de”, “von” or “of” are usually ignored when sorting. These can be identified using:

\DTLgidxParticle

```
\DTLgidxParticle{<text>}
```

Examples:

```
\newterm{\DTLgidxName{Fred}{\DTLgidxParticle{de}{Winter}}}
\newterm{\DTLgidxName{Gustav}{\DTLgidxParticle{von}{Aschenbach}}}
```

Here the names are sorted according to Winter\datatoolpersoncomma Fred and Aschenbach\datatoolpersoncomma Gustav but the labels are set to deWinter and vonAschenbach.

A person can also be indicated by their office, for example “Henry, scribe of Bury St Edmunds”. For this, you can use:

\DTLgidxOffice

```
\DTLgidxOffice{<office>}{<name>}
```

Here the label defaults to just <name>, so you may need to set the label manually to ensure uniqueness. Examples:

```
\newterm
[
  label={HenrySonJohn}
]
{\DTLgidxOffice{son \DTLgidxParticle{of}{John}}{Henry}}

\newterm
[
  label={HenryBeaumont}
]
{\DTLgidxOffice{bishop \DTLgidxParticle{of}{Bayeux}}{Henry
\DTLgidxParticle{de}{Beaumont}}}
```

```
\newterm
[
  label={HenryScribe}
```

```
]
{\DTLgidxOffice{scribe \DTLgidxParticle{of}{Bury}
 \DTLgidxSaint{St}~Edmunds}{Henry}}
```

You can hook into the mechanism that sets the default sort key by adding to the definition of

`\newtermlabelhook`

```
\newtermlabelhook
```

You can use `etoolbox`'s `\appto` command to append to this hook. For example, suppose you want to index the terms `\TeX`, `e\TeX` and `pdf\TeX`, but you want the terms to have the label and sort fields to be just `TeX`, `eTeX` and `pdfTeX`, then you can add to the hook so that it automatically converts `\TeX` to just `TeX`:

```
\appto\newtermlabelhook{\def\TeX{TeX}}
```

(Note that it's important to use the local `\def` rather than the global `\gdef` to ensure the redefinition is localised.)

Now the terms can simply be defined using:

```
\newterm{\TeX}
\newterm{e\TeX}
\newterm{pdf\TeX}
```

To assist in using this mechanism, the following commands are available (these commands may also be used in the mandatory argument of `\newterm`):

`\DTLgidxNoFormat`

```
\DTLgidxNoFormat{<text>}
```

This command simply does its argument, so any commands that should be stripped from the label or sort field without the loss of their argument can be `\let` to `\DTLgidxNoFormat`. For example, suppose you want to define a command called, say, `\appname` that you want to use to identify application names, like this:

```
\newcommand*\app{[1]{\texttt{#1}}}
```

This command needs to be stripped from the label and sort, so it can be added to the hook like this:

```
\appto\newtermlabelhook{\let\app\DTLgidxNoFormat}
```

Now you can define terms like this:

```
\newterm{\app{makeindex}}
\newterm{\app{xindy}}
```

The label and sort keys are then set to `makeindex` (for the first term) and `xindy` (for the second term).

`\DTLgidxGobble`

```
\DTLgidxGobble{⟨text⟩}
```

This command discards its argument, so it can be used if you not only want to strip a command but also its argument from the label and sort fields.

For example, suppose you want some terms to have a footnote (both in the index/glossary and in the document text) but the footnote shouldn't form part of the sort or label fields. You can add to the hook like this:

```
\appto\newtermlabelhook{\let\footnote\DTLgidxGobble}
```

Now you can define some terms with footnotes:

```
\newterm{foo\footnote{a note about foo}}
\newterm{bar\footnote{a note about bar}}
```

The label and sort keys are then set to `foo` (for the first term) and `bar` (for the second term).

`\DTLgidxIgnore`

```
\DTLgidxIgnore
```

This is similar to `\DTLgidxGobble` but only affects the sort key not the label.

Example:

```
\newterm{de\DTLgidxIgnore{-}escalate}
```

This is displayed as `de-escalate` and gets the label `de-escalate` but is sorted according to `deescalate`.

`\DTLgidxStripBackslash`

```
\DTLgidxStripBackslash{⟨control sequence⟩}
```

This can be used to “stringify” a control sequence and remove the leading backslash. For example, suppose you want to index the ampersand symbol (`&`) but you want to sort it according to the actual symbol `&`, you can do:

```
\newterm
[%
  label={amp},
  sort={\DTLgidxStripBackslash{\&}},
  text={ampersand (\&)},
  plural={ampersands (\&)},
]
{\& (ampersand)}
```

7.4 Referencing Terms

You can reference terms using

`\useentry`

```
\useentry{<label>}{<field>}
```

This fetches the given field for the term identified by *<label>*, displays it and marks the term as having been used. Example, suppose I have previous (in the preamble) defined the term “reptile” using:

```
\newterm{reptile}
```

I can now reference this term in the document:

```
\useentry{reptile}{Text}
```

or if I want the plural, I can use:

```
\useentry{reptile}{Plural}
```

There are also uppercase versions:

`\Useentry`

```
\Useentry{<label>}{<field>}
```

This makes the first letter uppercase (using the `mfirstuc` package) or to make the whole text uppercase use:

`\USEentry`

```
\USEentry{<label>}{<field>}
```

If you use the `hyperref` package, the above commands will automatically create hyperlinks to the relevant entry in the index/glossary. You can suppress this action by using one of the following analogous commands instead:

`\useentrynl`

```
\useentrynl{<label>}{<field>}
```

`\Useentrynl`

```
\Useentrynl{<label>}{<field>}
```

`\USEentrynl`

```
\USEentrynl{<label>}{<field>}
```

You can also specify your own custom text:

`\glslink`

```
\glslink{<label>}{<text>}
```

In all the above commands, the `<label>` argument may optionally start with `[<format>]`, where `format` is the name of a control name *without* the preceding backslash. This command will be applied to this location in the entry's location list when it's displayed in the index/glossary.

For example:

```
\useentry{[textbf]reptile}{Text}
```

Note that the command (`\textbf` in the above example) should take one argument (the location). If you attempt to use, say, a declaration (such as `\bfseries`) the effect won't be localised.

You can display the value of a field without indexing it using:

`\glsdispentry`

```
\glsdispentry{<label>}{<field>}
```

To make the first letter uppercase, use:

`\Glsdispentry`

```
\Glsdispentry{<label>}{<field>}
```

The above commands aren't expandable. If you want to fetch a value without displaying or using it, you can use:

`\DTLgidxFetchEntry`

```
\DTLgidxFetchEntry{<cs>}{<label>}{<field>}
```

where `<cs>` is a control sequence, `<label>` is the label that uniquely identifies the entry and `<field>` is the required field. The value of that field is stored in `<cs>`.

The predefined database fields are:

Name How the term appears in the index/glossary (as specified by the mandatory argument of `\newterm`).

Text The value of the text field.

Plural The value of the plural field.

Description The value of the description field.

Symbol The value of the symbol field.

Long The value of the long field.

Short The value of the short field.

LongPlural The value of the longplural field.

ShortPlural The value of the shortplural field.

See The value of the see field.

SeeAlso The value of the seealso field.

Sort The value of the sort field.

Parent The value of the parent field.

Label The entry's unique identifying label.

Used Has the value 1 (entry has been used) or either 0 or undefined (entry hasn't been used).

Location The entry's location list (picked up from the last \LaTeX run).

In addition, there are some fields designed for internal use: `Child`, `FirstId` and `CurrentLocation`.

You can add an entry to the index/glossary without displaying any text using:

`\glsadd`

```
\glsadd{<label>}
```

As with `\useentry`, `<label>` maybe in the form `[<format>]{<label>}` where `<format>` is the name of a control sequence *without* the leading backslash.

You can also add all entries from a particular database using

`\glsaddall`

```
\glsaddall{<db name>}
```

where `<db name>` is the name of the database.

Unlike the commands of the same name provided by the `glossaries` package, here there is a difference between `\glsaddall` and using `\glsadd` on all entries in the database. In the case of `\glsadd` a location is added to the location list for that entry. However in the case of `\glsaddall` no location is added to each entry's location list, but the location list is set to non-null so the entry will appear in the index/glossary.

7.4.1 Shortcut Commands

There are some shortcuts to common fields (if you are used to the glossaries package, note that these commands have different formats to the commands provided by glossaries with the same name):

`\gls`

```
\gls{<label>}
```

This is equivalent to `\useentry{<label>}{Text}`.

`\glspl`

```
\glspl{<label>}
```

This is equivalent to `\useentry{<label>}{Plural}`.

`\glsnl`

```
\glsnl{<label>}
```

This is equivalent to `\useentrynl{<label>}{Text}`.

`\glsplnl`

```
\glsplnl{<label>}
```

This is equivalent to `\useentrynl{<label>}{Plural}`.

`\Gls`

```
\Gls{<label>}
```

This is equivalent to `\Useentry{<label>}{Text}`.

`\Glspl`

```
\Glspl{<label>}
```

This is equivalent to `\Useentry{<label>}{Plural}`.

`\Glsnl`

```
\Glsnl{<label>}
```

This is equivalent to `\Useentrynl{<label>}{Text}`.

`\Glsplnl`

```
\Glsplnl{<label>}
```

This is equivalent to `\Useentrynl{<label>}{Plural}`.

`\glssym`

```
\glssym{<label>}
```

This is equivalent to `\useentry{<label>}{Symbol}`.

`\Glssym`

```
\Glssym{<label>}
```

This is equivalent to `\Useentry{<label>}{Symbol}`.

7.5 Adding Extra Fields

You can add new fields to the index/glossary database using:

`\newtermaddfield`

```
\newtermaddfield[<db list>]{<field name>}{<key name>}{<default value>}
```

The optional argument `<db list>` is a comma-separated list of databases that should have this new field. If omitted, the field will be added to all the defined databases. The argument `<field name>` is the label to give this new column in the database(s). The argument `<key name>` is the name of the new key to use in the optional argument of `\newterm`. The final argument `<default value>` is the default value if the key isn't used. Within `<default value>`, you may use

`\field`

```
\field{<key>}
```

to indicate the value of another key.

For example, suppose I want to be able to specify an alternative plural. I can add a new field like this:

```
\newtermaddfield{AltPlural}{altplural}{}
```

This adds a new column with the label `AltPlural` to each defined index/glossary database and adds a new key called `altplural` that I can now use in `\newterm`. The default is set to empty. Now I can define terms with an alternative plural:

```
\newterm[altplural=kine]{cow}
```

In the document, I can use `\gls{cow}` to display “cow”, `\glspl{cow}` to display “cows” and `\useentry{cow}{AltPlural}` to display “kine”. To make life a little easier, I can define a new command to save typing:

```
\newcommand*{\glsaltpl}[1]{\useentry{#1}{AltPlural}}
```


Now I can just do `\glsaltpl{cow}` to display “kine”.

Here’s another example. Suppose I want to add a field that produces the past tense of a verb. In this case, the default should be formed by appending “ed” to the text field. The new field can be defined as follows:

```
\newtermaddfield{Ed}{ed}{\field{text}ed}
```

This adds a new column labelled “Ed” and defines a new key called “ed” that can be used with `\newterm`. Now I can defined some verbs:

```
\newterm{jump}
\newterm[ed=went]{go}
```

Let’s define a convenience command to access this field:

```
\newcommand*{\glsed}[1]{\useentry{#1}{Ed}}
```

This new field can now be referenced in the document:

```
He \glsed{jump} over the gate.
She \glsed{go} to the shop.
```

The above will be displayed as: He jumped over the gate. She went to the shop.

7.6 Acronyms

You may have noticed that you can specify short and long fields when you define a new term. There is a convenient shortcut command which uses `\newterm` to define an acronym. The syntax is:

`\newacro`

```
\newacro[options]{short}{long}
```

This is a shortcut for

```
\newterm
[%
  description={\capitalisewords{long}},%
  short={\acronymfont{short}},%
  long={long},%
  text={\DTLgidxAcrStyle{long}{\acronymfont{short}}},%
  plural={\DTLgidxAcrStyle{longs}{\acronymfont{shorts}}},%
  sort={short},%
  options%
]%
\MakeTextUppercase{short}
```

where `\capitalisewords` is defined in `mfirstuc` (automatically loaded by `datagidx`) and `\MakeTextUppercase` is defined in `textcase` (automatically loaded by `datagidx`). The other commands used are defined by `datagidx`:

`\acronymfont`

```
\acronymfont
```

By default this just typesets its argument but can be redefined if the acronyms need to be typeset in a certain style (such as small caps).

`\DTLgidxAcrStyle`

```
\DTLgidxAcrStyle{<long>}{<short>}
```

This governs how the acronym is typeset in the text field. This defaults to: `<long>` (`<short>`).

7.6.1 Using Acronyms

You can use terms that represent acronyms via commands such as `\useentry`. For example, if you define the following in the preamble:

```
\newacro{css}{cascading style sheet}
```

then later in the text you can use:

```
\useentry{css}{Short}
```

to access the short form and

```
\useentry{css}{Long}
```

to access the long form. You can also use

```
\useentry{css}{Text}
```

(or `\gls{css}`) to access the full version. However with acronyms you generally only want the full form on first use and just the short form on subsequent use. The following commands are provided to do that. The singular form is obtained using:

`\acr`

```
\acr{<label>}
```

The plural form is obtained using:

`\acrpl`

```
\acrpl{<label>}
```

Note that, unlike the glossaries package, `\acr` isn't the same as `\gls`. With `datagidx`, `\gls` always references the text field. There is no "first" field.

Take care when using acronyms with beamer. Using overlays can cause problems with first use expansions.

As a general rule, you're not supposed to capitalise the first letter of an acronym (especially if it is displayed in small caps) but if you need to you can use:

`\Acr`

```
\Acr{<label>}
```

and

`\Acrpl`

```
\Acrpl{<label>}
```

7.6.2 Unsetting and Resetting Acronyms

You can reset a term so it's marked as not used with:

`\glsreset`

```
\glsreset{<label>}
```

or you can unset a term so it's marked as used with:

`\glsunset`

```
\glsunset{<label>}
```

You can reset all the terms defined in a given database using:

`\glsresetall`

```
\glsresetall{<db name>}
```

or unset all the terms defined in a given database using:

`\glsunsetall`

```
\glsunsetall{<db name>}
```

where `<db name>` is the name of the database as supplied when the database was defined using `\newgidx`.

7.7 Conditionals

You can test if a term exists using

`\iftermexists`

```
\iftermexists{<label>}{<true part>}{<false part>}
```

You can test if a term has been used using:

`\ifentryused`

```
\ifentryused{<label>}{<true part>}{<false part>}
```

7.8 Displaying the Index or Glossary

The index or glossary can be displayed using

`\printterms`

```
\printterms[<options>]
```

You will need to run \LaTeX at least twice to ensure your index/glossary is up-to-date. The first run will only display any entries that have a “See” field defined.

The optional argument `<options>` is a comma-separated list of `<key>=<value>` options. Available keys:

database The name of the database (as given in `\newgidx`).

postdesc This may have the value `dot` (put a full stop after the description) or `none` (don’t put a full stop after the description).

prelocation This indicates what to put before the location list. Available values:

none Nothing.

enspace An en-space.

space An ordinary space.

dotfill A dotted line (`\dotfill`).

hfill Expandable space (`\hfill`).

location This indicates how to display the location list. Available values:

hide Don’t display the location list.

list Display the location list.

first Only display the first location in the list.

symboldesc How to format the symbol in relation to the description. Available values:

- symbol** Display the symbol but not the description.
- desc** Display the description but not the symbol field.
- (symbol) desc** Display the symbol (if defined) in parentheses followed by the description.
- desc (symbol)** Display the description followed by the symbol (if defined) in parentheses.
- symbol desc** Display the symbol (if defined) followed by the description.
- desc symbol** Display the description followed by the symbol (if defined).
- columns** This should be a positive number that indicates the page column layout. If the value is greater than 1, the multicols environment is used (defined in the multicols package, which is automatically loaded).
- namecase** Indicates whether any case change should be applied to the entry's name field. Available values:
- nochange** Don't apply a case change.
 - uc** Convert the name to uppercase.
 - lc** Convert the name to lowercase.
 - firstuc** Convert the first letter to uppercase (using `\makefirstuc` defined in `mfirstuc`).
 - capitalise** Capitalise initial letters of each word in the name (using `\capitalisewords` defined in `mfirstuc`).
- namefont** The font changing command to apply to the name. (Include the initial backslash.) Declarations may be used.
- postname** What to put after the name.
- see** Indicates how the cross-reference (given in the "See" field) should be displayed. Available values:
- comma** Insert a comma followed by a space in front of the cross-reference.
 - brackets** Insert a space before the cross-reference and put the cross-reference in parentheses.
 - dot** Insert a full stop followed by a space in front of the cross-reference.
 - space** Insert a space before the cross-reference.
 - nosep** Don't insert anything before the cross-reference.
 - semicolon** Insert a semi-colon followed by a space in front of the cross-reference.
 - location** Display the cross-reference in the same way as a location.

- child** Indicates whether child entries should have their name displayed. Available values: `named` (display the child’s name) and `noname` (don’t display the child’s name).
- showgroups** Boolean option that indicates whether or not to insert group headings (and a group separator) between index groups, if headings are supported by the given style. If no value is supplied, `true` is assumed.
- style** The style to use. The value should be the name of the style. Available styles are listed in [subsection 7.8.1](#).
- symbolwidth** Some of the styles allow you to specify a width for the symbol field. This width can be specified with this option. The value will be ignored by some of the styles.
- locationwidth** Some of the styles allow you to specify a width for the location field. This width can be specified with this option. The value will be ignored by some of the styles.
- childsort** A boolean option that indicates whether or not the child entries should be sorted. If `true`, the child entries are listed using the same sort order as the sort applied to the database. If `false`, the child entries are listed in the order they were defined. If the value is missing, `true` is assumed.
- heading** The heading at the start of the index/glossary.
- postheading** What to put immediately after the heading.
- sort** How to sort the database. See [subsection 7.8.2](#) for further details.
- balance** This is a boolean option that is only applied if `columns` is greater than 1. If `true`, the columns are balanced. If `false`, the columns aren’t balanced. If no value is specified, `true` is assumed.
- condition** This specifies a boolean condition (as used by `\DTLforeach`) so you can display only those entries where the condition is met. For example, to only display entries starting with “H” (not including any entry that is just the letter “H”) you can do:

```
\printterms[condition={\DTLisbetween{\Name}{H}{I}}]
```

7.8.1 Index or Glossary Styles

The index or glossary style is given by the style key in the optional argument of `\newidx` or `\printterms`. The following styles are available:

- index** The “index” style is a basic style for an index. This style accepts the `locationwidth` and `symbolwidth` keys in `\printterms`. This is the default style.

indexalign The “indexalign” style is similar to the “index” style but aligns the descriptions.

align The “align” style aligns the fields. This style accepts the `locationwidth` and `symbolwidth` keys in `\printterms`.

gloss The “gloss” style is a basic glossary style. This style uses

`\DTLgidxChildSep`

```
\DTLgidxChildSep
```

as the separator between child entries (defaults to a space) and

`\DTLgidxPostChild`

```
\DTLgidxPostChild
```

to indicate what to put after the list of child entries (defaults to nothing).

dict The “dict” style is designed for dictionary-like glossaries. This assumes a hierarchical structure where the top level entries have a name. The next level is used to indicate a category (such as “adjective” or “noun”). If there is only one meaning for the term, this level also has a description. If there is more than one meaning, each meaning should be a child of the category entry. Only third level entries are numbered. No further levels are expected. The symbol field is ignored.

If `showgroups` is set, the group headers will be placed in a `\chapter` (if defined) or in a `\section` (if `\chapter` isn’t defined).

This style uses:

`\DTLgidxCategoryNameFont`

```
\DTLgidxCategoryNameFont{<text>}
```

The font used to display the name of the category (first child level).

`\DTLgidxCategorySep`

```
\DTLgidxCategorySep
```

The category separator. (Defaults to a space).

`\DTLgidxSubCategorySep`

```
\DTLgidxSubCategorySep
```

The category separator. (Defaults to a space).

```
\DTLgidxDictPostItem
```

```
\DTLgidxDictPostItem
```

Indicates what to do at the end of each top-level item. (Defaults to `\par`).

The indentation is given by the length register

```
\datagidxdictindent
```

```
\datagidxdictindent
```

This value defaults to 1em.

For additional commands that affect the style of the indexes or glossaries, see the documented code `datatool-code.pdf`.

7.8.2 Sorting the Index or Glossary Database

By default the index/glossary databases are sorted according to the `Sort` field using the `\dtlwordindexcompare` handler (see [section 6.8](#)). Note that the *entire* database is sorted, which is less efficient than using external indexing applications, such as `makeindex` or `xindy`, which only sort the terms that have been used in the document. In addition, the sorting algorithm used by `datatool` is less efficient than that used by a custom-built sorting and collation application.

The database is sorted at the start of `\printterms` according to the value of the sort key supplied by `\printterms`. To completely suppress the sorting, set this key to empty. Example:

```
\printterms[database=index,sort={},showgroups=false]
```

Note that in the above, I also switched off the group headers as they don't make sense with an unsorted index or glossary.

If you want to use a different comparison handler, you can set the sort key to the required sort command, where you can use

```
\DTLgidxCurrentdb
```

```
\DTLgidxCurrentdb
```

to indicate the current database.

For example, to sort using letter rather than word comparison:

```
\printterms[database=index,  
sort={\dtlsort{Sort}{\DTLgidxCurrentdb}{\dtlletterindexcompare}}]
```


You may recall from earlier that the index/glossary databases have a column labelled “FirstId”. This can be used if you want to sort the database according to the order of usage. Example:

```
\printterms [database=index,  
  sort={\dtlsort {FirstId}{\DTLgidxCurrentdb}{\dtlcompare}}]
```

Note that here I’ve used the `\dtlcompare` handler (which is the fastest handler) as I’m only concerned with a numerical rather than a string comparison.

The default value of the sort key is actually:

```
\dtlsort {Sort,FirstId}{\DTLgidxCurrentdb}{\dtlwordindexcompare}}
```

This means that entries with duplicate “Sort” fields are then sorted according to use.

Optimization

If you have used `xindy` or `makeindex`, you’ll be familiar with the document creation process. The document is first compiled, then the indexing application is run to sort and collate the entries, then the document is compiled again (and possible once more). This involves two (or three) \LaTeX runs and one sort and collate run. With the `datagidx` package, the sorting and collation is done every \LaTeX run. For a large index, this can be quite slow. If you’re not editing the index or glossary, you might prefer not to have to keep sorting the database whenever you update the document. To assist this, `datagidx` provides the `optimize` package option. This may take the following values:

- off** Don’t use the optimize facility. (The index/glossary databases will be sorted every run, unless the sort is switched off by setting the sort key to empty.)
- low** Use the “low” optimize setting. This only sorts the index/glossary databases every other run. (Assuming that the sorting is done via the `\printtermssort` key rather than explicitly using `\dtlsort` or `\DTLsort` somewhere else in the document.) Don’t use this option if sorting the databases makes the document out-of-date. (For example, the group headers use sectioning commands.)
- high** Use the “high” optimize setting. This sorts the index/glossary databases on the first run, then writes the sorted databases to external files, which are read in on subsequent runs. Again this assumes that the sorting is done via the `\printtermssort` key. Don’t use this option if you want to edit the index/glossary database.

7.9 Package Options

The following package options are available for `datagidx`:

- utf8** A boolean option (same as for `datatool-base`). If you both load `inputenc` with UTF-8 support and you use accent commands like `\’` or `\c` then make sure you have at least version 2.05 of `mfirstuc` if you want to use commands like `\Gls`.

- optimize** Sets the optimization. (See [section 7.8.2](#).)
- columns** Sets the default number of columns to use for the indexes or glossaries. (See [section 7.8](#).)
- child** Sets whether or not to show the name in child entries, where the style supports this option. (See [section 7.8](#).)
- namecase** Sets the case change for the entry's name. (See [section 7.8](#).)
- namefont** Sets the font for the entry's name. (See [section 7.8](#).)
- postname** Indicates what to put after the entry's name. (See [section 7.8](#).)
- postdesc** Indicates what to put after the entry's description. (See [section 7.8](#).)
- prelocation** Indicates what to put before the entry's location. (See [section 7.8](#).)
- location** Indicates how to display the entry's location. (See [section 7.8](#).)
- see** Indicates how to display the entry's cross-reference list. (See [section 7.8](#).)
- symboldesc** Indicates how to display the entry's symbol in relation to the description. (See [section 7.8](#).)
- compositor** Sets the location compositor. (See [section 7.2](#).)
- draft** Displays additional information, such as target names.
- final** Hides the draft information.
- verbose** Use datatool's verbose mode.
- nowarn** A boolean option that suppresses datagidx's rerun warnings.

Example 22 (Creating an Index)

In this document, I have used the `datagidx` package and the `hyperref` package. In the preamble, I have the following:

```
\usepackage{datagidx}
\usepackage[colorlinks]{hyperref}

\newgidx{index}{Index}% define a database for the index

\DTLgidxSetDefaultDB{index}% set this as the default

\newterm{mac\ 'edoine}
\newterm{macram\ 'e}
\newterm[label=elite]{\ 'e}lite}
\newterm{reptile}
```

```

\newterm[seealso={reptile}]{crocodylian}

\newterm
[%
  parent=crocodylian
]
{crocodile}

\newterm
[%
  parent=crocodylian
]
{alligator}

\newterm
[%
  parent=crocodylian,
  description={ (also cayman) }
]
{caiman}

\newterm[see={caiman}]{cayman}

```

Now here's some code to go in the document:

```

Here are some words containing accents: \gls{macedoine},
\gls{macrame} and \gls{elite}. \Gls{elite} requires extra care as it
starts with an accented letter. A \gls{crocodylian} is a family of
\glspl{reptile} consisting of \glspl{crocodile}, \glspl{alligator} and
\glspl{caiman}.

```

This produces the following:

Here are some words containing accents: **macédoine**, **macramé** and **élite**. **Élite** requires extra care as it starts with an accented letter. A **crocodilian** is a family of **reptiles** consisting of **crocodiles**, **alligators** and **caimans**.

The index can then be displayed using:

```

\printterms[heading={\section*},database=index]

```

This requires two runs to ensure the index is up-to-date. The resulting index is as follows:

Index

cayman	<i>see</i> caiman	<i>see also</i> reptile
crocodilian	139	élite 139
alligator	139	macédoine 139
caiman (also cayman)	139	macramé 139
crocodile	139	reptile 139

Here's the code if you want to add the letter groups (I've also added a dotted line before the location):

```
\printterms
[
  heading={\section*},
  database=index,
  prelocation=dotfill,
  showgroups
]
```

which produces:

Index

C		E	
cayman	<i>see</i> caiman	élite	139
crocydlian	139	M	
alligator	139	macédoine	139
caiman (also cayman)	139	macramé	139
crocodile	139	R	
<i>see also</i> reptile		reptile	139

8 Pie Charts (datapie package)

The datapie package is not loaded by the datatool package, so you need to explicitly load datapie if you want to use any of the commands defined in this section. You will also need to have the pgf/tikz packages installed. The datapie package may be given the following options:

color Colour option (default).

gray Grey scale option.

rotateinner Rotate inner labels so that they are aligned with the pie chart radial axis.

norotateinner Don't rotate inner labels (default).

rotateouter Rotate outer labels so that they are aligned with the pie chart radial axis.

norotateouter Don't rotate outer labels (default).

Numerical information contained in a database created by the datatool package can be converted into a pie chart using

`\DTLpiechart`

```
\DTLpiechart[<condition>]{<settings list>}{<db name>}{<values>}
```

where *<db name>* is the name of the database, and *<condition>* has the same form as the optional argument to `\DTLforeach` described in [section 6.4](#). If *<condition>* is false, that information is omitted from the construction of the pie chart. The argument *<values>* is a comma separated list of *<cmd>=<key>* pairs, the same as that required by the penultimate argument of `\DTLforeach`. The *<settings list>* is a comma separated list of *<setting>=<value>* pairs, where *<setting>* can be any of the following:

variable This specifies the control sequence to use that contains the value used to construct the pie chart. The control sequence must be one of the control sequences to appear in the assignment list *<values>*. This setting is required.

start This is the starting angle of the first segment. The value is 0 by default.

radius This is the radius of the pie chart. The default value is 2cm.

innerratio The distance from the centre of the pie chart to the point where the inner labels are placed is given by this value multiplied by the radius. The default value is 0.5.

- outerratio** The distance from the centre of the pie chart to the point where the outer labels are placed is given by this value multiplied by the radius. The default value is 1.25.
- cutawayratio** The distance from the centre of the pie chart to the point of cutaway segments is given by this value multiplied by the radius. The default value is 0.2.
- inneroffset** This is the absolute distance from the centre of the pie chart to the point where the inner labels are placed. You should use only one or other of `innerratio` and `inneroffset`, not both. If you also want to specify the radius, you must use `radius` before `inneroffset`. If omitted, the inner offset is obtained from the radius multiplied by the `innerratio` value.
- outeroffset** This is the absolute distance from the centre of the pie chart to the point where the outer labels are placed. You should use only one or other of `outerratio` and `outeroffset`, not both. If you also want to specify the radius, you must use `radius` before `outeroffset`. If omitted, the outer offset is obtained from the radius multiplied by the `outerratio` value.
- cutawayoffset** This is the absolute distance from the centre of the pie chart to the point of the cutaway segments. You should use only one or other of `cutawayratio` and `cutawayoffset`, not both. If you also want to specify the radius, you must use `ratio` before `cutawayoffset`. If omitted, the cutaway offset is obtained from the ratio multiplied by the `cutawayratio` value.
- cutaway** This is a list of cutaway segments. This should be a comma separated list of individual numbers, or number ranges (separated by a dash). For example `cutaway={1, 3}` will separate the first and third segments from the rest of the pie chart, offset by the value of the `cutawayoffset` setting, whereas `cutaway={1-3}` will separate the first three segments from the rest of the pie chart. If omitted, the pie chart will be whole.
- innerlabel** The value of this is positioned in the middle of each segment at a distance of `inneroffset` from the centre of the pie chart. The default is the same as the value of variable.
- outerlabel** The value of this is positioned at a distance of `outeroffset` from the centre of the pie chart. The default is empty.
- rotateinner** This is a boolean setting, so it can only take the values `true` and `false`. If the value is omitted `true` is assumed. If `true`, the inner labels are rotated along the spokes of the pie chart, otherwise the inner labels are not rotated. There are analogous package options `rotateinner` and `norotateinner`.
- rotateouter** This is a boolean setting, so it can only take the values `true` and `false`. If the value is omitted `true` is assumed. If `true`, the outer labels are rotated along the spokes of the pie chart, otherwise the outer labels are not rotated. There are analogous package options `rotateouter` and `norotateouter`.

Example 23 (A Pie Chart)

This example loads data from a file called `fruit.csv` which contains the following:

```
Name,Quantity
"Apples",30
"Pears",25
"Lemons,Limes",40.5
"Peaches",34.5
"Cherries",20
```

First load the data:

```
\DTLloaddb{fruit}{fruit.csv}
```

Now create a pie chart in a figure:

```
\begin{figure}[htbp]
\centering
\DTLpiechart{variable=\quantity}{fruit}{\name=Name,\quantity=Quantity}
\caption{A pie chart}
\end{figure}
```

This creates [Figure 8.1](#). The colours used are the defaults. See [example 27](#) for an example that changes the default colours.

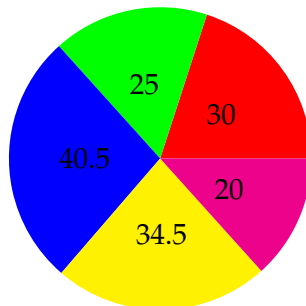


Figure 8.1: A pie chart

There are no outer labels by default, but they can be set using the `outerlabel` setting. The following sets the outer label to the value of the `Name` key:

```
\begin{figure}[htbp]
\centering
\DTLpiechart{variable=\quantity,outerlabel=\name}{fruit}{%
\name=Name,\quantity=Quantity}
\caption{A pie chart (outer labels set)}
\end{figure}
```

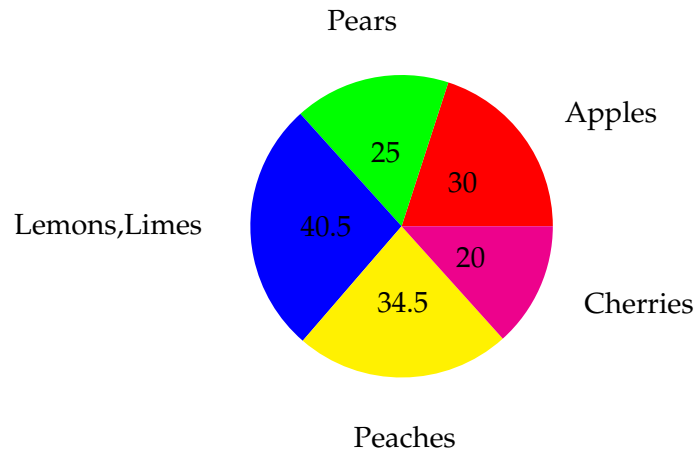


Figure 8.2: A pie chart (outer labels set)

This creates [Figure 8.2](#).

You may prefer the labels to be rotated. The following switches on the rotation for the inner and outer labels:

```
\begin{figure}[htbp]
\centering
\DTLpiechart{variable=\quantity,outerlabel=\name,%
rotateinner,rotateouter}{fruit}{%
\name=Name,\quantity=Quantity}
\caption{A pie chart (rotation enabled)}
\end{figure}
```

This creates [Figure 8.3](#).

Example 24 (Separating Segments from the Pie Chart)

You may want to separate one or more segments from the pie chart, perhaps to emphasize them. You can do this using the cutaway setting. The following separates the first and third segments from the pie chart:

```
\begin{figure}[htbp]
\centering
\DTLpiechart{variable=\quantity,outerlabel=\name,%
cutaway={1,3}}{fruit}{%
\name=Name,\quantity=Quantity}
\caption{A pie chart with cutaway segments}
\end{figure}
```

This produces [Figure 8.4](#).

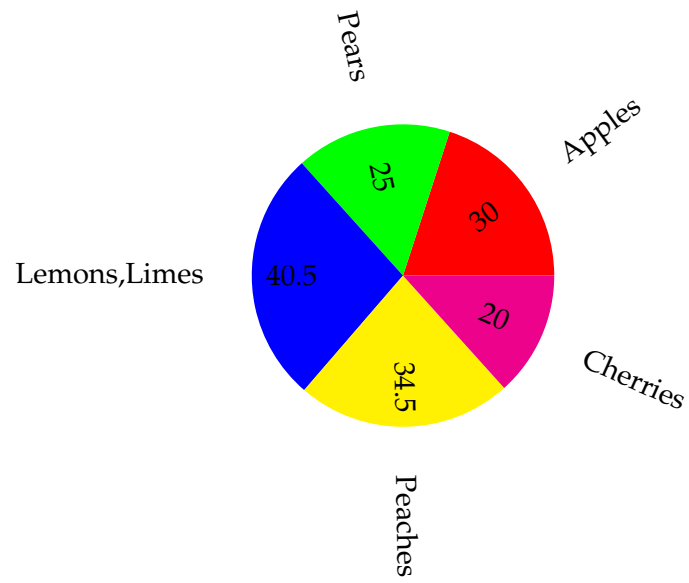


Figure 8.3: A pie chart (rotation enabled)

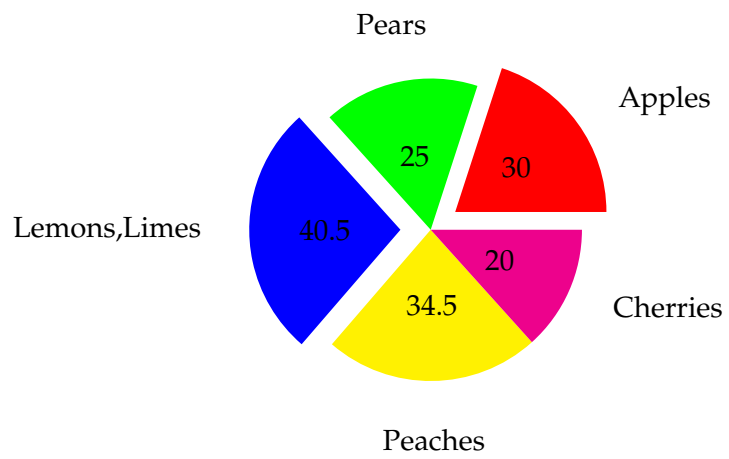


Figure 8.4: A pie chart with cutaway segments

Alternatively I can specify a range of segments. The following separates the first two segments:

```
\begin{figure}[htbp]
\centering
\DTLpiechart{variable=\quantity,outerlabel=\name,%
cutaway={1-2}}{fruit}{%
\name=Name,\quantity=Quantity}
\caption{A pie chart with cutaway segments (\texttt{cutaway=\{1-2\}})}
\end{figure}
```

This produces **Figure 8.5**.

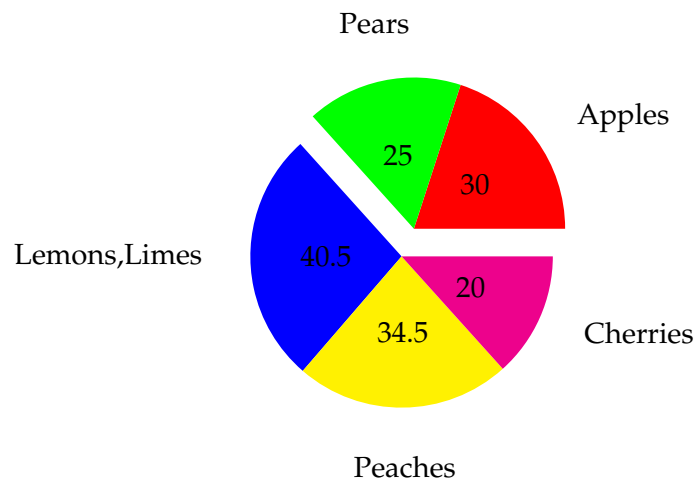


Figure 8.5: A pie chart with cutaway segments (`cutaway={1-2}`)

Notice the difference between **Figure 8.5** and **Figure 8.6** which was produced using:

```
\begin{figure}[htbp]
\centering
\DTLpiechart{variable=\quantity,outerlabel=\name,%
cutaway={1,2}}{fruit}{%
\name=Name,\quantity=Quantity}
\caption{A pie chart with cutaway segments (\texttt{cutaway=\{1,2\}})}
\end{figure}
```

8.1 Pie Chart Variables

`\DTLpievariable`

`\DTLpievariable`

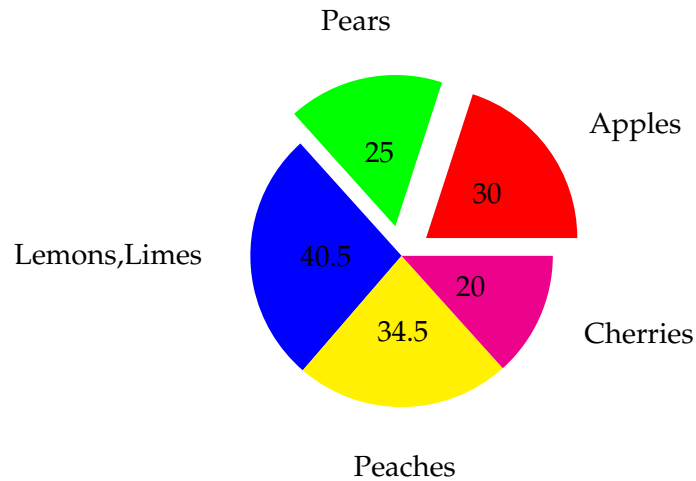


Figure 8.6: A pie chart with cutaway segments (`cutaway={1,2}`)

This command is set to the variable given by the variable setting in the *settings list* argument of `\DTLpiechart`. The innerlabel is set to `\DTLpievariable` by default.

`\DTLpiepercent`

`\DTLpiepercent`

This command is set to the percentage value of `\DTLpievariable`. The percentage value is rounded to $\langle n \rangle$ digits, where $\langle n \rangle$ is the value of the \LaTeX counter

`\DTLpiepercent`

Example 25 (Changing the Inner and Outer Labels)

This example uses the database defined in [example 23](#). The inner label is now set to the percentage value, rather than the actual value, and the outer label is set to the name with the actual value in parentheses.

```
\begin{figure}[htbp]
\centering
\DTLpiechart{variable=\quantity,%
innerlabel={\DTLpiepercent\%},%
outerlabel={\name\ (\DTLpievariable)}}{fruit}{%
\name=Name,\quantity=Quantity}
\caption{A pie chart (changing the labels)}
\end{figure}
```

This produces [Figure 8.7](#).

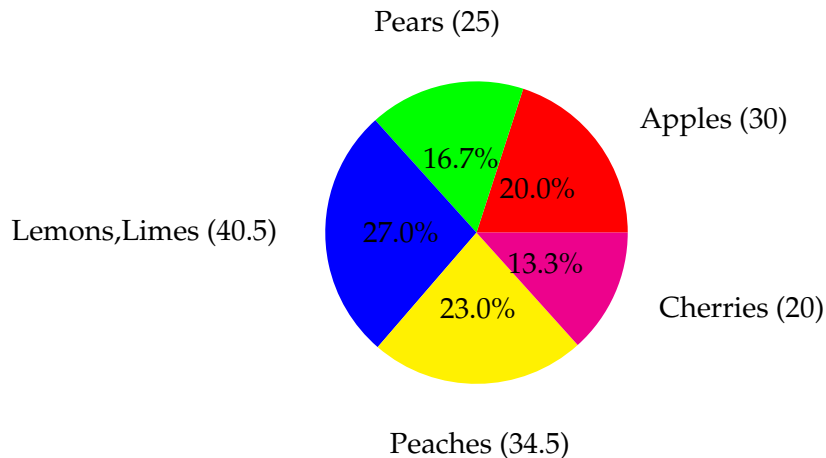


Figure 8.7: A pie chart (changing the labels)

8.2 Pie Chart Label Formatting

`\DTLdisplayinnerlabel`

```
\DTLdisplayinnerlabel{<text>}
```

This governs how the inner label is formatted, where `<text>` is the text of the inner label. The default is to just do `<text>`.

`\DTLdisplayouterlabel`

```
\DTLdisplayouterlabel{<text>}
```

This governs how the outer label is formatted, where `<text>` is the text of the outer label. The default is to just do `<text>`.

Example 26 (Changing the Inner and Outer Label Format)

This example extends [example 25](#). The inner and outer labels are now both typeset in a sans-serif font:

```
\begin{figure}[htbp]
\centering
\renewcommand*{\DTLdisplayinnerlabel}[1]{\textsf{#1}}
\renewcommand*{\DTLdisplayouterlabel}[1]{\textsf{#1}}
\DTLpiechart{variable=\quantity,%
innerlabel={\DTLpiepercent\%},%
outerlabel={\name\ (\DTLpievariable)}}{fruit}{%
\name=Name,\quantity=Quantity}
\caption{A pie chart (changing the label format)}
\end{figure}
```

This produces [Figure 8.8](#).

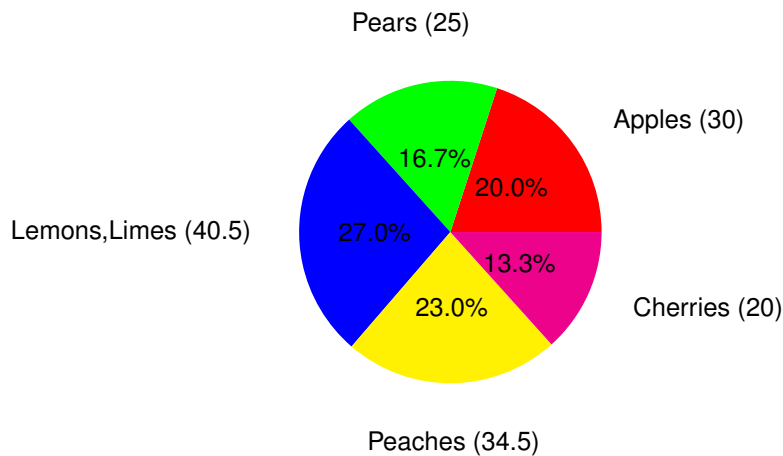


Figure 8.8: A pie chart (changing the label format)

8.3 Pie Chart Colours

The `datapie` package predefines colours for the first eight segments of the pie chart. If you require more than eight segments or if you want to change the default colours, you will need to use

```
\DTLsetpiesegmentcolor
```

```
\DTLsetpiesegmentcolor{<n>}{<color>}
```

The first argument $\langle n \rangle$ is the segment index (starting from 1), and the second argument $\langle color \rangle$ is a colour specifier as used in commands such as `\color`.

It is a good idea to set the colours so that each segment colour is somehow relevant to whatever the segment represents. For example, in the previous examples of pie charts depicting fruit, some of default colours were inappropriate. Whilst red is appropriate for apples and green is appropriate for pears, blue doesn't really correspond to lemons or limes.

```
\DTLdopiesegmentcolor
```

```
\DTLdopiesegmentcolor{<n>}
```

This sets the current text colour to that of the $\langle n \rangle$ th segment.

```
\DTLdocurrentpiesegmentcolor
```

```
\DTLdocurrentpiesegmentcolor
```

This sets the current text colour to that of the current pie segment. This command may only be used within a pie chart, or within the body of `\DTLforeach`.

```
\DTLpieoutlinecolor
```

```
\DTLpieoutlinecolor
```

This sets the outline colour for the pie chart. The default is black.

```
\DTLpieoutlinewidth
```

```
\DTLpieoutlinewidth
```

This is a length that governs the line width of the outline. The default value is 0pt, but can be changed using `\setlength`. The outline is only drawn if `\DTLpieoutlinewidth` is greater than 0pt.

Example 27 (Pie Segment Colours)

This example extends [example 26](#). It sets the outline thickness to 2pt, and the outer label is now set in the same colour as the fill colour of the segment to which it belongs. The third segment (lemons and limes) is set to yellow and the fourth segment (peaches) is set to pink. In addition, a legend is created using `\DTLforeach`.

```
\begin{figure} [htbp]
\centering
\setlength{\DTLpieoutlinewidth}{2pt}
\DTLsetpiesegmentcolor{3}{yellow}
\DTLsetpiesegmentcolor{4}{pink}
\renewcommand*{\DTLdisplayinnerlabel}[1]{\textsf{#1}}
\renewcommand*{\DTLdisplayouterlabel}[1]{%
\DTLdocurrentpiesegmentcolor
\textsf{\shortstack{#1}}}
\DTLpiechart{variable=\quantity,%
innerlabel={\DTLpiepercent\%},%
outerlabel={\name\ (\DTLpievariable)}}{fruit}{%
\name=Name,\quantity=Quantity}
\begin{tabular}[b]{l}
\DTLforeach{fruit}{\name=Name}{\DTLiffirstrow}{\ \ \ \%
\DTLdocurrentpiesegmentcolor\rule{10pt}{10pt} &
\name
}
\end{tabular}
\caption{A pie chart (using segment colours and outline)}
\end{figure}
```

This produces [Figure 8.9](#). (The format of the outer label has been changed to use `\shortstack` to prevent the outer labels from taking up so much horizontal space.

The `outerlabel` setting has also been modified to use `\` after the name to move the percentage value onto the next row.)

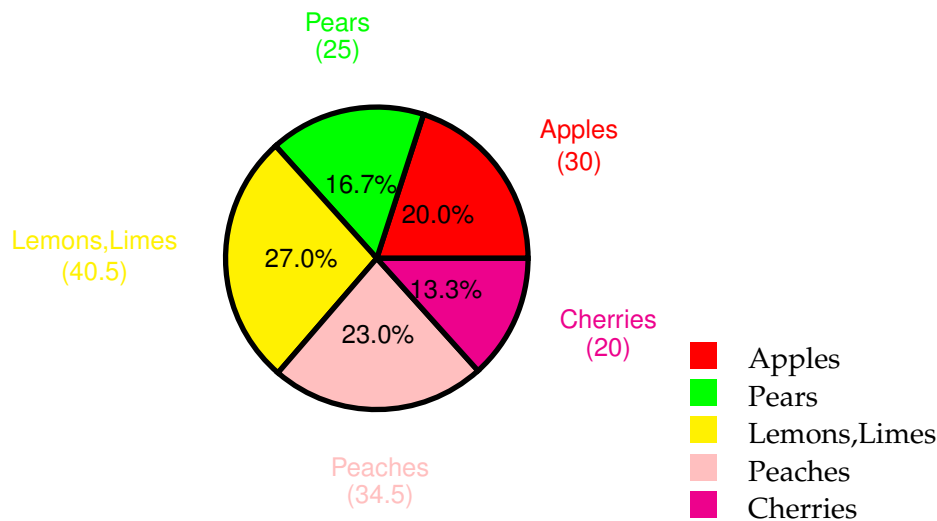


Figure 8.9: A pie chart (using segment colours and outline)

8.4 Adding Extra Commands Before and After the Pie Chart

The pie charts created using `\DTLpiechart` are placed inside a `tikzpicture` environment (defined by the `tikz` package).

```
\DTLpieatbegintikz
```

```
\DTLpieatbegintikz
```

The macro `\DTLpieatbegintikz` is called at the start of the `tikzpicture` environment, allowing you to change the `tikzpicture` settings. By default `\DTLpieatbegintikz` does nothing, but you can redefine it to, say, scale the pie chart (but be careful not to distort the chart).

```
\DTLpieatendtikz
```

```
\DTLpieatendtikz
```

The macro `\DTLpieatendtikz` is called at the end of the `tikzpicture` environment, allowing you add additional graphics to the pie chart. This does nothing by default.

Example 28 (Adding Information to the Pie Chart)

This example modifies [example 23](#). It redefines `\DTLpieatendtikz` to add an

annotated arrow.

```
\begin{figure}[htbp]
\centering
\renewcommand*{\DTLpieatendtikz}{%
\draw[<-] (45:1.5cm) -- (40:2.5cm)node[right]{Apples};}
\DTLpiechart{variable=\quantity}{fruit}{%
\name=Name,\quantity=Quantity}
\caption{An annotated pie chart}
\end{figure}
```

This produces **Figure 8.10**. (Note that the centre of the pie chart is the origin of the TikZ picture.)

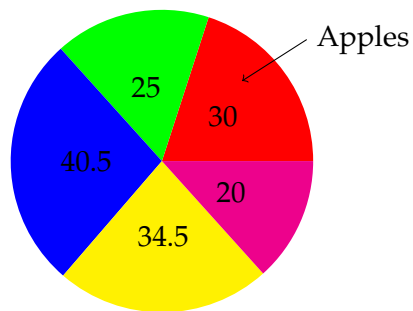


Figure 8.10: An annotated pie chart

9 Scatter and Line Plots (dataplot package)

The dataplot package provides commands for creating scatter or line plots from databases. It uses the pgf/TikZ plot handler library to create the plots. See the pgf manual for more detail on pgf streams and plot handles. The dataplot package is not loaded by datatool so if you want to use it you need to load it explicitly using `\usepackage{dataplot}`.

`\DTLplot`

```
\DTLplot[<condition>]{<db list>}{<settings>}
```

This command creates a plot (inside a tikzpicture environment) of all the data given in the databases listed in *<db list>*, which should be a comma separated list of database names. The optional argument *<condition>* is the same as that for `\DTLforeach`. The *<settings>* argument is a comma separated list of *<setting>*=*<value>* pairs. There are two settings that must be specified *x* and *y*. The other settings are optional. Note that any value that contains a comma, must be enclosed in braces. For example `colors={red,cyan,blue}`. Note where any setting requires a number, or list of numbers (such as bounds) the number must be supplied in standard decimal notation (i.e. no currency, no number groups, and a full stop as the decimal point). Available settings are as follows:

x The database key that specifies the *x* co-ordinates. This setting is required.

y The database key that specifies the *y* co-ordinates. This setting is required.

markcolors A comma separated list of colour names for the markers. An empty value will use the current colour.

linecolors A comma separated list of colour names for the plot lines. An empty value will use the current colour.

colors A comma separated list of colour names for the lines and markers.

marks A comma separated list of code to generate plot marks. (This should typically be a list of `\pgfuseplotmark` commands, see the pgf manual for further details.) You may use `\relax` as an element of the list to suppress markers for the corresponding plot. For example:

`marks={\pgfuseplotmark{o},\relax}` will use an open circle marker for the first database, and no markers for the second database listed in *<db list>*.

- lines** A comma separated list of line style settings. (This should typically be a list of `\pgfsetdash` commands, see the pgf manual for further details on how to set the line style.) An empty value will use the current line style. You may use `\relax` as an element of the list to suppress line for the corresponding plot. For example: `lines={\relax, \pgfsetdash{}{0pt}}` will have no lines for the first database, and a solid line for the second database listed in *(db list)*.
- width** The width of the plot. This must be a length. The plot width does not include outer tick marks or labels.
- height** The height of the plot. This must be a length. The plot height does not include outer tick marks or labels.
- style** This setting governs whether to use lines or markers in the plot, and may take one of the following values: `both` (lines and markers), `lines` (only lines) or `markers` (only markers). The default is `markers`.
- axes** This setting governs whether to display the axes, and may take one of the following values: `both`, `x`, `y` or `none`. If no value is specified, `both` is assumed.
- box** This setting governs whether or not to surround the plot in a box. It is a boolean setting, taking only the values `true` and `false`. If no value is specified, `true` is assumed.
- xtics** This setting governs whether or not to display the x tick marks. It is a boolean setting, taking only the values `true` and `false`. If no value is specified `true` is assumed. If the `axes` setting is set to `both` or `x`, this value will automatically be set to `true`, otherwise it will be set to `false`.
- ytics** This setting governs whether or not to display the y ticks. It is a boolean setting, taking only the values `true` and `false`. If no value is specified `true` is assumed. If the `axes` setting is set to `both` or `y`, this value will automatically be set to `true`, otherwise it will be set to `false`.
- xminortics** This setting governs whether or not to display the x minor tick marks. It is a boolean setting, taking only the values `true` and `false`. If no value is specified `true` is assumed. This setting also sets the x major tick marks on if the value is `true`.
- yminortics** This setting governs whether or not to display the y minor tick marks. It is a boolean setting, taking only the values `true` and `false`. If no value is specified `true` is assumed. This setting also sets the y major tick marks on if the value is `true`.
- xticdir** This sets the x tick direction, and may only take the values `in` or `out`.
- ycticdir** This sets the y tick direction, and may only take the values `in` or `out`.

ticdir This sets the x and y tick direction, and may only take the values `in` or `out`.

bounds The value must be in the form $\langle \text{min } x \rangle, \langle \text{min } y \rangle, \langle \text{max } x \rangle, \langle \text{max } y \rangle$. This sets the graph bounds to the given values. If omitted the bounds are computed from the maximum and minimum values of the data. For example

```
\DTLplot{data1,data2}{x=Height,y=Weight,bounds={0,0,10,20}}
```

Note that the `bounds` setting overrides the `minx`, `maxx`, `miny` and `maxy` settings.

minx The value is the minimum value of the x axis.

miny The value is the minimum value of the y axis.

maxx The value is the maximum value of the x axis.

maxy The value is the maximum value of the y axis.

xticpoints The value must be a comma separated list of decimal numbers indicating where to put the x tick marks. If omitted, the x tick marks are placed at equal intervals along the x axis such that each interval is not less than the length given by `\DTLmintickgap`. This setting overrides `xticgap`.

xticgap This value specifies the gap between the x tick marks.

yticpoints The value must be a comma separated list of decimal numbers indicating where to put the y tick marks. If omitted, the y tick marks are placed at equal intervals along the y axis such that each interval is not less than the length given by `\DTLmintickgap`. This setting overrides `yticgap`.

yticgap This value specifies the gap between the y tick marks.

grid This is a boolean value that specifies whether or not to display the grid. If no value is given, `true` is assumed. The minor grid lines are only displayed if the minor tick marks are set.

xticlabels The value must be a comma separated list of labels for each x tick mark. If omitted, the labels are the value of the x tick position, rounded $\langle n \rangle$ digits after the decimal point, where $\langle n \rangle$ is given by the value of the counter `DTLplotroundXvar`.

yticlabels The value must be a comma separated list of labels for each y tick mark. If omitted, the labels are the value of the y tick position, rounded $\langle n \rangle$ digits after the decimal point, where $\langle n \rangle$ is given by the value of the counter `DTLplotroundYvar`.

xlabel The value is the label for the x axis. If omitted, the axis has no label.

ylabel The value is the label for the y axis. If omitted, the axis has no label.

legend This setting governs whether or not to display the legend, and where it should be displayed. It may take one of the following values `none` (don't display the legend), `north`, `northeast`, `east`, `southeast`, `south`, `southwest`, `west` or `northwest`. If the value is omitted, `northeast` is assumed.

legendlabels The value must be a comma separated list of labels for the legend. If omitted, the database names are used.

Example 29 (A Basic Graph)

Suppose you have a file called `groupa.csv` that contains the following:

```
Height,Weight
1.54,48.0
1.55,45.4
1.56,58.0
1.56,50.2
1.57,46.0
1.58,48.3
1.59,56.5
1.59,58.1
1.60,60.9
1.62,56.3
```

First load this into a database called `groupa`:

```
\DTLloaddb{groupa}{groupa.csv}
```

The data can now be converted into a scatter plot as follows:

```
\begin{figure}[htbp]
\centering
\DTLplot{groupa}{x=Height,y=Weight}
\caption{A scatter plot}
\end{figure}
```

This produces [Figure 9.1](#).

Alternatively, you can use the `style` setting to change it into a line plot:

```
\begin{figure}[htbp]
\centering
\DTLplot{groupa}{x=Height,y=Weight,style=lines}
\caption{A line plot}
\end{figure}
```

This produces [Figure 9.2](#).

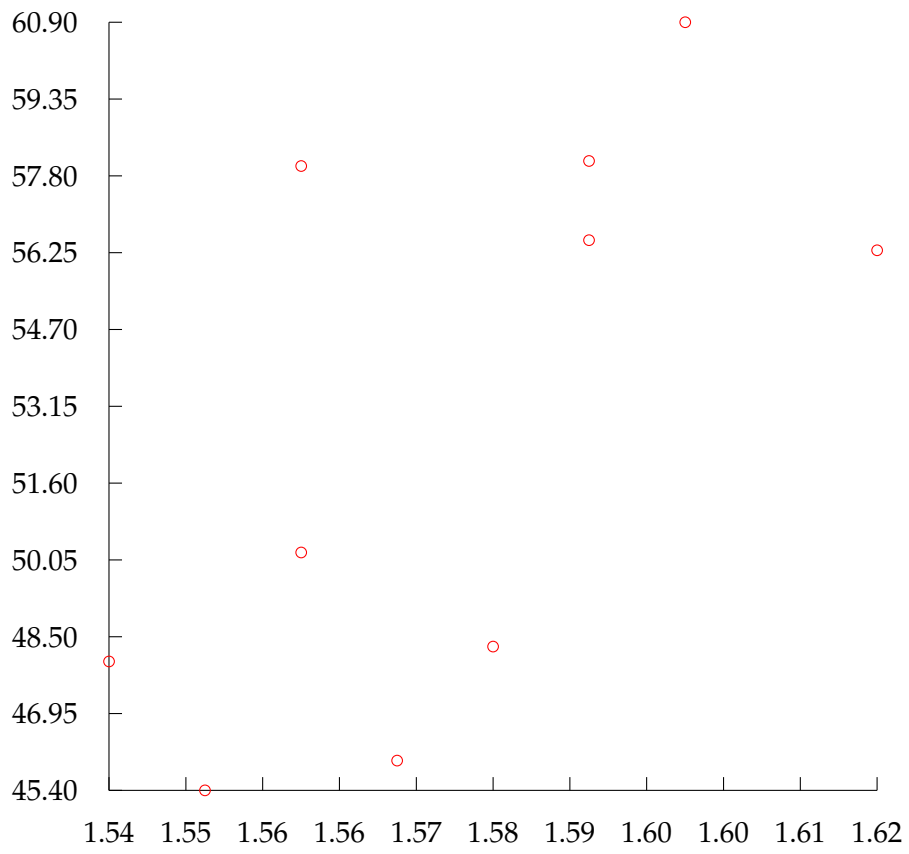


Figure 9.1: A scatter plot

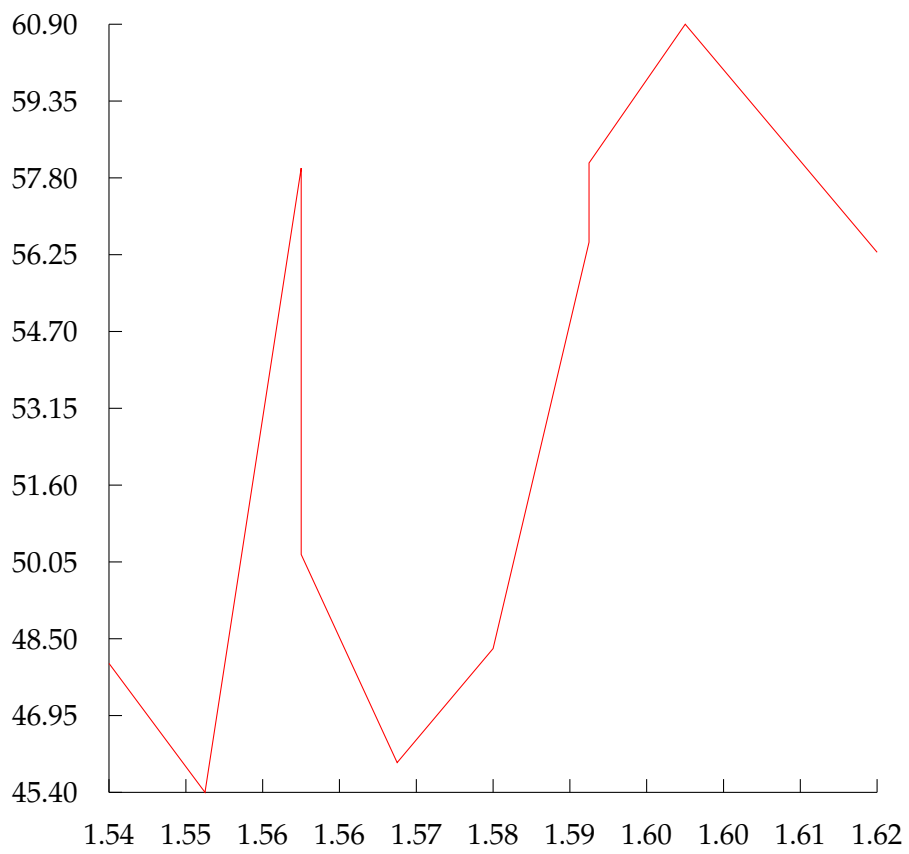


Figure 9.2: A line plot

Example 30 (Plotting Multiple Data Sets)

In this example, I shall use the database called `groupa` defined in [example 29](#), and another database called `groupb` which is loaded from the file `groupb.csv` which contains the following:

```
Height,Weight
1.54,48.4
1.54,42.0
1.55,64.0
1.56,58.2
1.56,49.0
1.57,40.3
1.58,51.5
1.58,63.1
1.59,74.9
1.59,59.3
```

First load this into a database called `groupb`:

```
\DTLloaddb{groupb}{groupb.csv}
```

I can now plot both groups in the same graph, but I want a smaller graph than [Figure 9.1](#) and [Figure 9.2](#), so I am going to set the plot width and height to 3in:

```
\begin{figure}[htbp]
\centering
\DTLplot{groupa,groupb}{x=Height,y=Weight,width=3in,height=3in}
\caption{A scatter plot}
\end{figure}
```

This produces [Figure 9.3](#).

Now let's add a legend using the `legend` setting, with the legend labels `Group A` and `Group B`, and set the x tick intervals using `xticpoints` setting. I am also going to set the x axis label to `Height (m)` and the y axis label to `Weight (kg)`, and place a box around the plot.

```
\begin{figure}[htbp]
\centering
\DTLplot{groupa,groupb}{x=Height,y=Weight,
width=3in,height=3in,legend,legendlabels={Group A,Group B},
xlabel={Height (m)},ylabel={Weight (kg)},box,
xticpoints={1.54,1.55,1.56,1.57,1.58,1.59,1.60,1.61,1.62}}
\caption{A scatter plot}
\end{figure}
```

This produces [Figure 9.4](#).

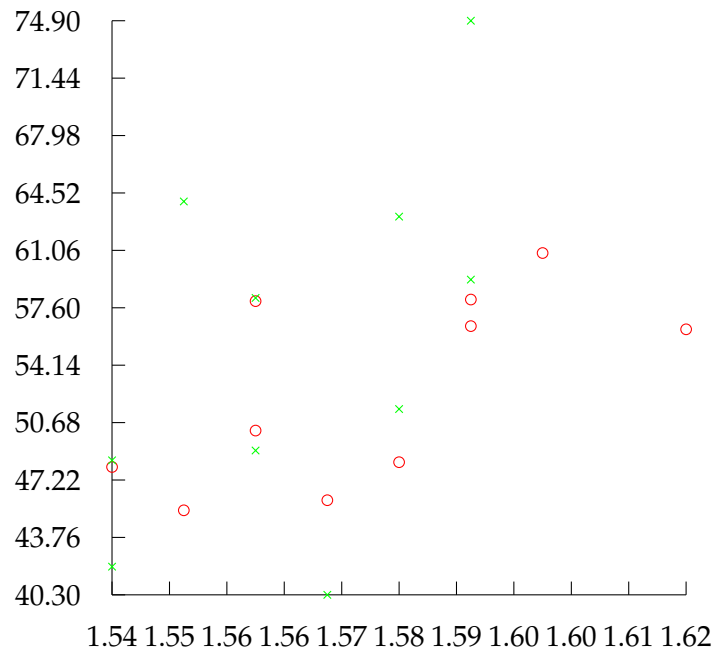


Figure 9.3: A scatter plot

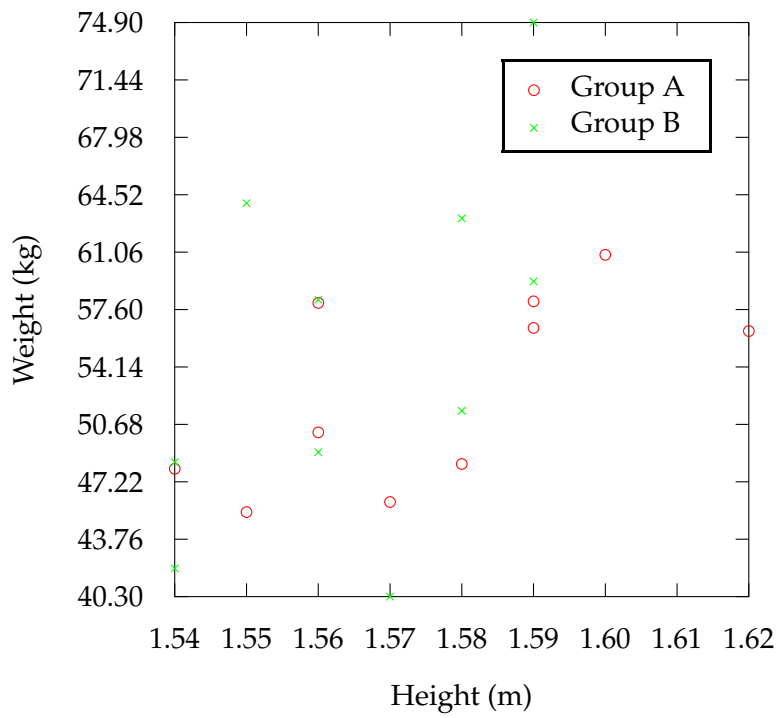


Figure 9.4: A scatter plot

9.1 Adding Information to the Plot

The `datatool` package provides two hooks used at the beginning and end of the `tikzpicture` environment:

```
\DTLplotatbegintikz
```

```
\DTLplotatbegintikz
```

and

```
\DTLplotatendtikz
```

```
\DTLplotatendtikz
```

They are both defined to do nothing by default, but can be redefined to add commands to the image. The unit vectors are set prior to using these hooks, so you can use the same co-ordinates as those in the data sets. However, to reduce the problem of exceeding \TeX 's maximum dimension, `\DTLplot` scales the plot which may distort plot marks. To get around this use

```
\dtlplothandlermark
```

```
\dtlplothandlermark{<pgf code>}
```

instead of `\pgfplothandlermark{<pgf code>}`. (See [example 33](#).) Note that `\dtlplothandlermark` is only intended for use within the definition of `\DTLplotatbegintikz` or `\DTLplotatendtikz`. If used elsewhere it will produce a warning and act as though you'd just used `\pgfplothandlermark`.

```
\DTLaddtoplotlegend
```

```
\DTLaddtoplotlegend{<marker>}{<line style>}{<text>}
```

This adds a new row to the plot legend where `<marker>` is code to produce the marker, `<line style>` is code to set the line style and `<text>` is a textual label. You can use `\relax` to suppress the marker or line. For example:

```
\DTLaddtoplotlegend{\pgfuseplotmark{x}}{\relax}{Some Data}
```

Note that the legend is plotted before `\DTLplotatendtikz`, so if you want to add information to the legend you will need to do the in `\DTLplotatstarttikz`.

Example 31 (Adding Information to a Plot)

Returning to the plots created in [example 30](#), suppose I now want to annotate the plot, say I want to draw your notice to a particular point, say the point (1.58,48.3), then I can redefine `\DTLplotatendtikz` to draw an annotated arrow to that point:

```
\renewcommand*{\DTLplotatendtikz}{%
```

```

\draw[<-,line width=1pt] (1.58,48.3) -- (1.6,43)
  node[below]{interesting point};
}

```

So Figure 9.4 now looks like Figure 9.5. (Obviously, `\DTLplotatendtikz` needs to be redefined before using `\DTLplot`.)

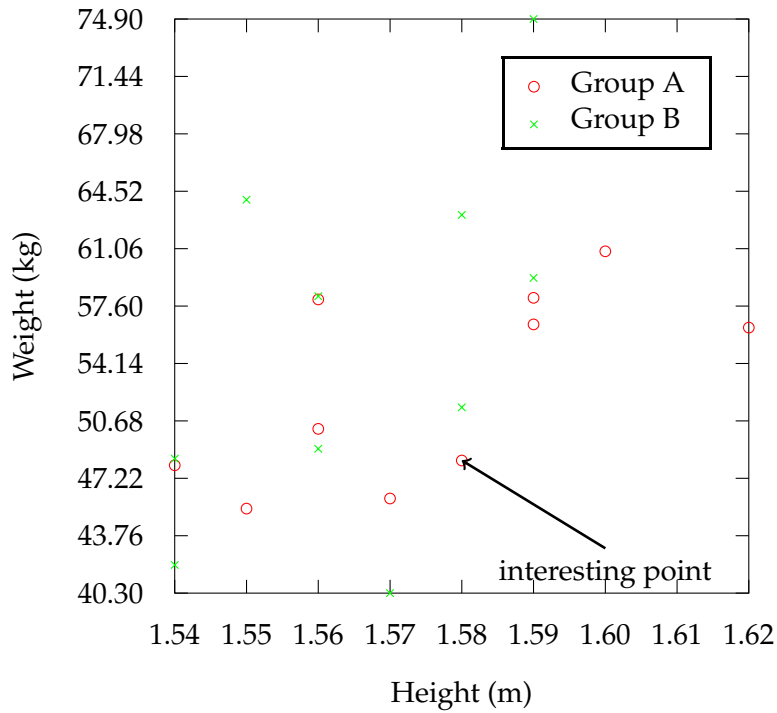


Figure 9.5: A scatter plot

9.2 Global Plot Settings

9.2.1 Lengths

This section describes the lengths that govern the appearance of the plot created using `\DTLplot`. These lengths can be changed using `\setlength`.

`\DTLplotwidth`

`\DTLplotwidth`

This length governs the length of the x axis. Note that the plot width does not include any outer tick marks or labels. The default value is 4in.

`\DTLplotheight`

```
\DTLplotheight
```

This length governs the length of the y axis. Note that the plot height does not include any outer tick marks or labels. The default value is 4in

`\DTLticklength`

```
\DTLticklength
```

This governs the length of the tick marks. The default value is 5pt.

`\DTLminorticklength`

```
\DTLminorticklength
```

This governs the length of the minor tick marks. The default value is 2pt.

`\DTLticklabeloffset`

```
\DTLticklabeloffset
```

This governs the distance from the axis to the tick labels. The default value is 8pt.

`\DTLmintickgap`

```
\DTLmintickgap
```

This is the minimum distance allowed between tick marks. If the plot width or height is less than this distance there will only be tick marks at either end of the axis. The default value is 20pt.

`\DTLlegendxoffset`

```
\DTLlegendxoffset
```

This is the horizontal distance from the border of the plot to the outer border of the legend. The default value is 10pt.

`\DTLlegandyoffset`

```
\DTLlegandyoffset
```

This is the vertical distance from the border of the plot to the outer border of the legend. The default value is 10pt.

9.2.2 Counters

These counters govern the appearance of plots created using `\DTLplot`. The value of the counters can be changed using `\setcounter`.

DTLplotroundXvar

`DTLplotroundXvar`

Unless you specify your own tick labels, the x tick labels will be given by the tick points rounded to $\langle n \rangle$ digits after the decimal point, where $\langle n \rangle$ is the value of the counter `DTLplotroundXvar`.

DTLplotroundYvar

`DTLplotroundYvar`

Unless you specify your own tick labels, the y tick labels will be given by the tick points rounded to $\langle n \rangle$ digits after the decimal point, where $\langle n \rangle$ is the value of the counter `DTLplotroundYvar`.

9.2.3 Macros

These macros govern the appearance of plots created using `\DTLplot`. They can be changed using `\renewcommand`.

`\DTLplotmarks`

`\DTLplotmarks`

This must be a comma separated list of pgf code to create the plot marks. `\DTLplot` cycles through this list for each database listed. The pgf package provides convenient commands for generating plots using `\pgfuseplotmark`. See the pgf manual for more details.

`\DTLplotmarkcolors`

`\DTLplotmarkcolors`

This must be a comma separated list of defined colours to apply to the plot marks. `\DTLplot` cycles through this list for each database listed. If this macro is set to empty, the current colour will be used instead.

`\DTLplotlines`

`\DTLplotlines`

This must be a comma separated list of pgf code to set the style of the plot lines. `\DTLplot` cycles through this list for each database listed. Dash patterns can be set using `\pgfsetdash`, see the pgf manual for more details. If `\DTLplotlines` is set to empty the current line style will be used instead.

`\DTLplotlinecolors`

`\DTLplotlinecolors`

This must be a comma separated list of defined colours to apply to the plot lines. `\DTLplot` cycles through this list for each database listed. If this macro is set to empty, the current colour will be used instead. The default is the same as `\DTLplotmarkcolors`.

`\DTLXAxisStyle`

```
\DTLXAxisStyle
```

This governs the style of the x axis. It is passed as the optional argument to the TikZ `\draw` command. By default it is just `-` which is a solid line style with no start or end arrows. The x axis line starts from the bottom left corner of the plot and extends to the bottom right corner of the plot. So if you want the x axis to have an arrow head at the right end, you can do:

```
\renewcommand*{\DTLXAxisStyle}{->}
```

`\DTLYAxisStyle`

```
\DTLYAxisStyle
```

This governs the style of the y axis. It is analogous to `\DTLXAxisStyle` described above.

`\DTLmajorgridstyle`

```
\DTLmajorgridstyle
```

This specifies the format of the major grid lines. It may be set to any TikZ setting that you can pass to the optional argument of `\draw`. The default value is `color=gray,-` which indicates a grey solid line.

`\DTLminorgridstyle`

```
\DTLminorgridstyle
```

This specifies the format of the minor grid lines. It may be set to any TikZ setting that you can pass to the optional argument of `\draw`. The default value is `color=gray,loosely dotted` which indicates a grey dotted line.

`\DTLformatlegend`

```
\DTLformatlegend{\langle legend \rangle}
```

This formats the entire legend, which is passed as the argument. The default is to set the legend with a white background, a black frame.

9.3 Adding to a Plot Stream

`\DTLplotstream`

```
\DTLplotstream[<condition>]{<db name>}{<x key>}{<y key>}
```

This adds points to a stream from the database called *<db name>* where the *x* co-ordinates are given by the key *<x key>* and the *y* co-ordinates are given by the key *<y key>*. (`\DTLconverttodecimal` is used to convert locale dependent values to a standard decimal that is recognised by the `pgf` package.) The optional argument *<condition>* is the same as that for `\DTLforeach`.

Example 32 (Adding to a Plot Stream)

Suppose you have a CSV file called `data.csv` containing the following:

```
x,y  
0,0  
1,1  
2,0.5  
1.5,0.3
```

First load the file into a database called `data`:

```
\DTLloaddb{data}{data.csv}
```

Now create a figure containing this data:

```
\begin{figure}[tbhp]  
  \centering  
  \begin{tikzpicture}  
    \pgfplotandlermark{\pgfuseplotmark{o}}  
    \pgfplotstreamstart  
    \DTLplotstream{data}{x}{y}%  
    \pgfplotstreamend  
    \pgfusepath{stroke}  
  \end{tikzpicture}  
  \caption{Adding to a plot stream}  
\end{figure}
```

This produces [Figure 9.6](#).

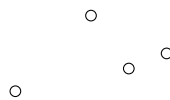


Figure 9.6: Adding to a plot stream

Example 33 (Plotting Multiple Keys in the Same Database)

Suppose I have conducted two time to growth experiments. For each experiment, I have recorded the log count at set times, and I have recorded this information in the same data file called, say, `growth.csv` which contains the following:

```
Time, Experiment 1, Experiment 2
0, 3.73, 3.6
23, 3.67, 3.7
60, 4.9, 3.8
```

I can load the data into a database using:

```
\DTLloaddb{growth}{growth.csv}
```

However, I'd like to plot both results on the same graph. Since they are contained in the same database, I can't use the method I used in [example 30](#). Instead I can use a combination of `\DTLplot` and `\DTLplotstream`:

```
\begin{figure}[tbhp]
\centering
% compute bounds
\DTLminforkeys{growth}{Time}{\minX}
\DTLminforkeys{growth}{Experiment 1, Experiment 2}{\minY}
\DTLmaxforkeys{growth}{Time}{\maxX}
\DTLmaxforkeys{growth}{Experiment 1, Experiment 2}{\maxY}
% round x tick labels to 1 d.p.
\setcounter{DTLplotroundXvar}{1}
% redefine \DTLplotatbegintikz to plot the data for Experiment 1
\renewcommand*{\DTLplotatbegintikz}{%
% set plot mark
\dtlplotohandlermark{\color{green}\pgfuseplotmark{x}}
% start plot stream
\pgfplotstreamstart
% add data from Experiment 1 to plot stream
\DTLplotstream{growth}{Time}{Experiment 1}%
% end plot stream
\pgfplotstreamend
% stroke path
\pgfusepath{stroke}
% add information to legend (no line is require so use \relax)
\DTLaddtoplotlegend{\color{green}%
\pgfuseplotmark{x}}{\relax}{Experiment 1}
}
% now plot the data for Experiment 2
\DTLplot{growth}{x=Time,y=Experiment 2, legend,
width=3in,height=3in,bounds={\minX,\minY,\maxX,\maxY},
xlabel={Time},ylabel={Log Count},
legendlabels={Experiment 2}}
\caption{Time to growth data}
\end{figure}
```

This produces **Figure 9.7**. Notes:

- I redefined `\DTLplotatbegintikz` in order to add the new plot to the legend, since `\DTLplotatendtikz` is used after the legend is plotted. The x and y unit vectors are set before `\DTLplotatbegintikz` so I don't need to worry about the co-ordinates, however I've had to use `\dtlplothandlermark` instead of `\pgfplothandlermark` to prevent the plot marks from being distorted.
- I have used `\DTLminforkeys` and `\DTLmaxforkeys` to determine the bounds since `\DTLplot` won't take the data for Experiment 1 into account when computing the bounds.

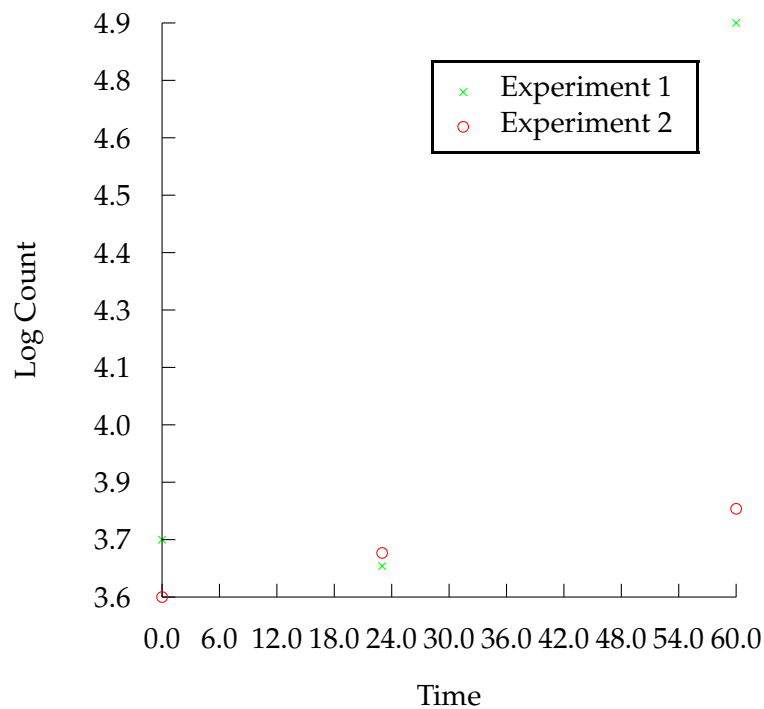


Figure 9.7: Time to growth data

10 Bar Charts (databar package)

The `databar` package provides commands for creating bar charts. It is not loaded by the `datatool` package, so if you want to use it you will need to load it explicitly using `\usepackage{databar}`. You must also have the `pgf` package installed.

Bar charts can either be vertical or horizontal, the default is vertical. In this section the x axis refers to the horizontal axis when plotting a vertical bar chart and to the vertical axis when plotting a horizontal bar chart. The x axis units are in increments of one bar. The y axis refers to the vertical axis when plotting a vertical bar chart and to the horizontal axis when plotting a horizontal bar chart. The y axis uses the same co-ordinates as the data. The bars may have an upper and lower label. In a vertical bar chart, the lower label is placed below the x axis and the upper label is placed above the top of the bar. In a horizontal bar chart, the lower label is placed to the left of the x axis and the upper label is placed to the right of the end of the bar. (This is actually a misnomer as it is possible for the “upper” label to be below the “lower” label if a bar has a negative value, however the bars are considered to be anchored on the x axis, and the other end of the bar is considered to be the “upper” end, regardless of its direction.)

The `databar` package options are as follows:

color Created coloured bar charts (default).

gray Created grey scale bar charts.

vertical Created vertical bar charts (default).

horizontal Created horizontal bar charts.

`\DTLbarchart`

```
\DTLbarchart[ $\langle condition \rangle$ ]{ $\langle settings \rangle$ }{ $\langle db name \rangle$ }{ $\langle values \rangle$ }
```

`\DTLmultibarchart`

```
\DTLmultibarchart[ $\langle condition \rangle$ ]{ $\langle settings \rangle$ }{ $\langle db name \rangle$ }{ $\langle values \rangle$ }
```

These commands both create a bar chart from the information in the database $\langle db name \rangle$, where $\langle condition \rangle$ is the same as the optional argument for `\DTLforeach` described in [section 6.4](#), and $\langle values \rangle$ is the same as the penultimate argument of `\DTLforeach`. The $\langle settings \rangle$ argument is a $\langle setting \rangle = \langle value \rangle$ list of settings. The first command, `\DTLbarchart`, will draw a bar chart for a given column of data in the

database, whereas the second command, `\DTLmultibarchart`, will draw a bar chart that is divided into groups of bars where each bar within a group represents data from several columns of a given row in the database.

The variable setting is required for `\DTLbarchart` and the variables, the other settings are optional (though some may only be used for one of `\DTLbarchart` and `\DTLmultibarchart`), and are as follows:

- variable** This specifies the control sequence to use that contains the value used to construct the bar chart. The control sequence must be one of the control sequences to appear in the assignment list *<values>*. This setting is required for `\DTLbarchart`, and is unavailable for `\DTLmultibarchart`.
- variables** This specifies a list of control sequences to use which contain the values used to construct the bar chart. Each control sequence must be one of the control sequences to appear in the assignment list *<values>*. This setting is required for `\DTLmultibarchart`, and is unavailable for `\DTLbarchart`.
- max** This specifies the maximum value on the *y* axis. (This should be a standard decimal value.)
- length** This specifies the overall length of the *y* axis, and must be a dimension.
- maxdepth** This must be a zero or negative number. It specifies the maximum depth of the *y* axis. (This should be a standard decimal value.)
- axes** This setting specifies which axes to display. This may take one of the following values: *both*, *x*, *y* or *none*.
- barlabel** This setting specifies the lower bar label. When used with `\DTLmultibarchart` it indicates the group label.
- multibarlabels** This setting should contain a comma separated list of labels for each bar within a group for `\DTLmultibarchart`. This setting is not available for `\DTLbarchart`.
- upperbarlabel** This setting specifies the upper bar label. This setting is not available for `\DTLmultibarchart`.
- uppermultibarlabels** This setting must be a comma separated list of upper bar labels for each bar within a group. This setting is not available for `\DTLbarchart`.
- yticpoints** This must be a comma separated list of tick locations for the *y* axis. (These should be standard decimal values.) This setting overrides `yticgap`.
- yticgap** This specifies the gap between the *y* tick marks. (This should be a standard decimal value.)
- yticlabels** This must be a comma separated list of tick labels for the *y* axis.

ylabel This specifies the label for the y axis.

groupgap This specifies the gap between groups when using `\DTLmultibarchart`. This value is given as a multiple of the bar width. The default value is 1, which indicates a gap of one bar width. This setting is not available for `\DTLbarchart`.

verticalbars This is a boolean setting, so it can only take the values `true` (do a vertical bar chart) or `false` (do a horizontal bar chart). If the value is omitted, `true` is assumed.

Example 34 (A Basic Bar Chart)

Recall [example 23](#) defined a database called `fruit`. This example will be using that database to plot a bar chart. The following plots a basic vertical bar chart:

```
\begin{figure}[htbp]
\centering
\DTLbarchart{variable=\theQuantity}{fruit}{\theQuantity=Quantity}
\caption{A basic bar chart}
\end{figure}
```

This produces [Figure 10.1](#).

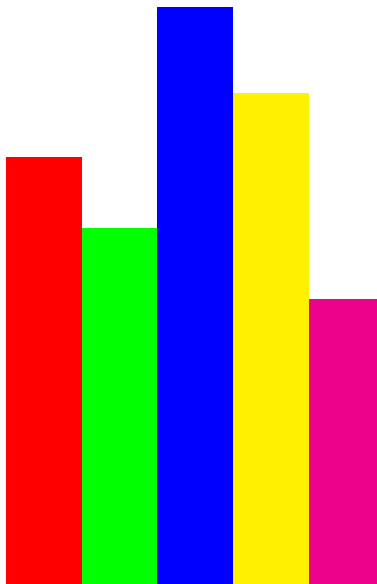


Figure 10.1: A basic bar chart

10.1 Changing the Appearance of a Bar Chart

`\DTLbarchartlength`

```
\DTLbarchartlength
```

This specifies the total length of the y axis. You must use `\setlength` to change this value. The default value is 3in.

`\DTLbarwidth`

```
\DTLbarwidth
```

This specifies the width of each bar. You must use `\setlength` to change this value. The default value is 1cm.

`\DTLbarlabeloffset`

```
\DTLbarlabeloffset
```

This specifies the distance from the x axis to the lower bar label. You must use `\setlength` to change this value. The default value is 10pt.

`DTLbarroundvar`

```
DTLbarroundvar
```

The y tick labels are rounded to $\langle n \rangle$ digits after the decimal point, where $\langle n \rangle$ is given by the value of the counter `DTLbarroundvar`. You must use `\setcounter` to change this value.

`\DTLsetbarcolor`

```
\DTLsetbarcolor{\langle n \rangle}{\langle color \rangle}
```

This sets the $\langle n \rangle$ th bar colour to $\langle color \rangle$. Only the first eight bars have a colour defined by default. If you need more than eight bars, you will need to define more bar colours. It is recommended that you set the colour of each bar to correspond with whatever the bar represents.

`\DTLdobarcolor`

```
\DTLdobarcolor{\langle n \rangle}
```

This sets the current colour to the colour of the $\langle n \rangle$ th bar.

`\DTLbaroutlinecolor`

```
\DTLbaroutlinecolor
```

This macro contains the colour of the bar outlines. This defaults to `black`.

`\DTLbaroutlinewidth`

```
\DTLbaroutlinewidth
```

This length specifies the line width for the bar outlines. If it is `0pt`, the outline is not drawn. The default value is `0pt`.

`\DTLbaratbegintikz`

```
\DTLbaratbegintikz
```

This specifies any additional commands to add to the start of the plot. It defaults to nothing, and is called after the unit vectors are set.

`\DTLbaratendtikz`

```
\DTLbaratendtikz
```

This specifies any additional commands to add to the end of the plot. It defaults to nothing.

`\DTLeverybarhook`

```
\DTLeverybarhook
```

This specifies code to apply at every bar. Within the definition of `\DTLeverybarhook` you can use the commands `\DTLstartpt` (the start of the bar), `\DTLmidpt` (the mid point of the bar) and `\DTLendpt` (the end of the bar). For example (using the earlier fruit database):

```
\renewcommand*{\DTLeverybarhook}{%
\pgftext[at=\DTLmidpt]{\insertName\space(\insertValue)}%
}
\DTLbarchart{variable=\insertValue,axes=both,
ylabel=Quantity,max=50,verticalbars=false
}%
{fruit}{\insertValue=Value,\insertName=Name}
```

This puts the name followed by the quantity in brackets in the middle of the bar.

`\ifDTLverticalbars`

```
\ifDTLverticalbars
```

This conditional governs whether the chart uses vertical or horizontal bars.

`\DTLbarXlabelalign`

```
\DTLbarXlabelalign
```

This specifies the text alignment of the lower bar labels. This defaults to `left`, `rotate=-90` if you use the vertical package option or the `verticalbars` setting, and

defaults to `right` if you use the `horizontal` package option or the `verticalbars=false` setting.

`\DTLbarYticklabelalign`

```
\DTLbarYlabelalign
```

This specifies the text alignment of the y axis labels. This defaults to `right` for vertical bar charts and `center` for horizontal bar charts.

`\DTLbardisplayYticklabel`

```
\DTLbardisplayYticklabel{\text}
```

This specifies how to display the y tick label. The argument is the tick label.

`\DTLdisplaylowerbarlabel`

```
\DTLdisplaylowerbarlabel{\text}
```

This specifies how to display the lower bar label for `\DTLbarchart` and the lower bar group label for `\DTLmultibarchart`. The argument is the label.

`\DTLdisplaylowermultibarlabel`

```
\DTLdisplaylowermultibarlabel{\text}
```

This specifies how to display the lower bar label for `\DTLmultibarchart`. The argument is the label. This command is ignored by `\DTLbarchart`.

`\DTLdisplayupperbarlabel`

```
\DTLdisplayupperbarlabel{\text}
```

This specifies how to display the upper bar label for `\DTLbarchart` and the upper bar group label for `\DTLmultibarchart`. The argument is the label.

`\DTLdisplayuppermultibarlabel`

```
\DTLdisplayuppermultibarlabel{\text}
```

This specifies how to display the upper bar label for `\DTLmultibarchart`. The argument is the label. This command is ignored by `\DTLbarchart`.

Example 35 (A Labelled Bar Chart)

This example extends [example 34](#) so that the chart is a bit more informative (which is after all the whole point of a chart). This chart now has a label below each bar, as well as a label above the bar. The lower label uses the value of the `Name` key, and the upper label uses the quantity. I have also set the outline width so each bar has a border.

```

\begin{figure}[htbp]
\setlength{\DTLbaroutlinewidth}{1pt}
\centering
\DTLbarchart{variable=\theQuantity,barlabel=\theName,%
upperbarlabel=\theQuantity}{fruit}{%
\theQuantity=Quantity,\theName=Name}
\caption{A bar chart}
\end{figure}

```

This produces **Figure 10.2**.

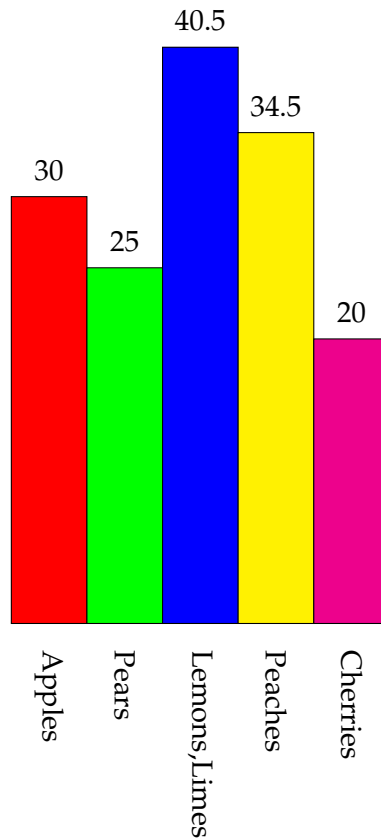


Figure 10.2: A bar chart

Example 36 (Profit/Loss Bar Chart)

Suppose I have a file called `profits.csv` that looks like:

```

Year,Profit
2000,\pounds2,535

```

```
2001, \pounds3,752
2002, -\pounds1,520
2003, \pounds1,270
```

First I can load this file into a database called profits:

```
\DTLloaddb{profits}{profits.csv}
```

Now I can plot the data as a bar chart:

```
\begin{figure}[htbp]
\centering
% Set the width of each bar to 10pt
\setlength{\DTLbarwidth}{10pt}
% Set the outline width to 1pt
\setlength{\DTLbaroutlinewidth}{1pt}
% Round the $y$ tick labels to integers
\setcounter{DTLbarroundvar}{0}
% Adjust the tick label offset
\setlength{\DTLticklabeloffset}{20pt}
% Change the y tick label alignment
\renewcommand*{\DTLbarYticklabelalign}{left}
% Rotate the y tick labels
\renewcommand*{\DTLbardisplayYticklabel}[1]{\rotatebox{-45}{#1}}
% Set the bar colours depending on the value of \theProfit
\DTLforeach{profits}{\theProfit=Profit}{%
\ifthenelse{\DTLislt{\theProfit}{0}}
{\DTLsetbarcolor{\DTLcurrentindex}{red}}
{\DTLsetbarcolor{\DTLcurrentindex}{blue}}}
% Do the bar chart
\DTLbarchart{variable=\theProfit,upperbarlabel=\theYear,
ylabel={Profit/Loss (\pounds)},verticalbars=false,
maxdepth=-2000,max=4000}{profits}
{\theProfit=Profit,\theYear=Year}
\caption{Profits for 2000--2003}
\end{figure}
```

This produces [Figure 10.3](#). Notes:

1. This example uses `\rotatebox`, so the `graphics` or `graphicx` package is required.
2. The y tick labels are too wide to fit horizontally so they have been rotated to avoid overlapping with their neighbour.
3. Rotating the y tick labels puts them too close to the y axis, so `\DTLticklabeloffset` is made larger to compensate.
4. Remember not to use `\year` as an assignment command as this command already exists!
5. Before the bar chart is created I have iterated through the database, setting the bar colour to red or blue depending on the value of `\theProfit`.

Both `\DTLbarchart` and `\DTLmultibarchart` set the following macros, which may be used in `\DTLbaratbegin tikz` and `\DTLbaratend tikz`:

`\DTLbarchartwidth`

```
\DTLbarchartwidth
```

This is the overall width of the bar chart. In the case of `\DTLbarchart` this is just the number of bars. In the case of `\DTLmultibarchart` it is computed as:

$$m \times n + (m - 1) \times g$$

where m is the number of bar groups (i.e. the number of rows of data), n is the number of bars within a group (i.e. the number of commands listed in the variables) setting and g is the group gap (as specified by the `groupgap` setting).

`\DTLnegextent`

```
\DTLnegextent
```

This is set to the negative extent of the bar chart. (This value may either be zero or negative, and corresponds to the `maxdepth` setting.)

`\DTLbarmax`

```
\DTLbarmax
```

This is set to the maximum extent of the bar chart. (This value corresponds to the `max` setting.)

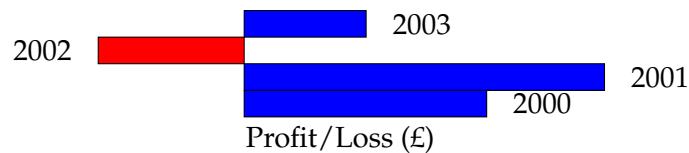


Figure 10.3: Profits for 2000–2003

Example 37 (A Multi-Bar Chart)

This example uses the `marks` database described in [example 14](#). Recall that this database stores student marks for three assignments. The keys for the assignment marks are `Assignment 1`, `Assignment 2` and `Assignment 3`, respectively. I can convert this data into a bar chart using the following:

```
\begin{figure}[htbp]
\centering
```

```

\DTLmultibarchart{variables={\assignI,\assignII,\assignIII},
barwidth=10pt,uppermultibarlabels={\assignI,\assignII,\assignIII},
barlabel={\firstname\ \surname}}{marks}{%
\surname=Surname,\firstname=FirstName,\assignI=Assignment 1,%
\assignII=Assignment 2,\assignIII=Assignment 3}
\caption{Student marks}
\end{figure}

```

This produces [Figure 10.4](#). Notes:

1. I used `variables={\assignI,\assignII,\assignIII}` to set the variable to use for each bar within a group. This means that there will be three bars in each group.
2. I have set the bar width to 10pt, otherwise the chart will be too wide.
3. I used `uppermultibarlabels={\assignI,\assignII,\assignIII}` to set the upper labels for each bar within a group. This will print the assignment mark above the relevant bar.
4. I used `barlabel={\firstname\ \surname}` to place the student's name below the group corresponding to that student.

Recall that [example 14](#) computed the average score over for each student, and saved it with the key `Average`. This information can be added to the bar chart. It might also be useful to compute the average over all students and add this information to the chart. This is done as follows:

```

\begin{figure}[htbp]
\centering
% compute the overall mean
\DTLmeanforkeys{marks}{Average}{\overallmean}
% round it to 2 decimal places
\DTLround{\overallmean}{\overallmean}{2}
% draw a grey dotted line indicating the overall mean
% covering the entire width of the bar chart
\renewcommand*{\DTLbaratendtikz}{%
\draw[lightgray,loosely dotted] (0,\overallmean) --
(\DTLbarchartwidth,\overallmean)
node[right,black]{Average (\overallmean)}; }
% Set the lower bar labels to draw a brace across the current
% group, along with the student's name and average score
\renewcommand*{\DTLdisplaylowerbarlabel}[1]{%
\tikz[baseline=(current bounding box.center)]{
\draw[snake=brace,rotate=-90] (0,0) -- (\DTLbargroupwidth,0);
\DTLround{\theMean}{\theMean}{2}%
\shortstack{#1\\(Average: \theMean)}}
% draw the bar chart
\DTLmultibarchart{variables={\assignI,\assignII,\assignIII},
barwidth=10pt,uppermultibarlabels={\assignI,\assignII,\assignIII},

```

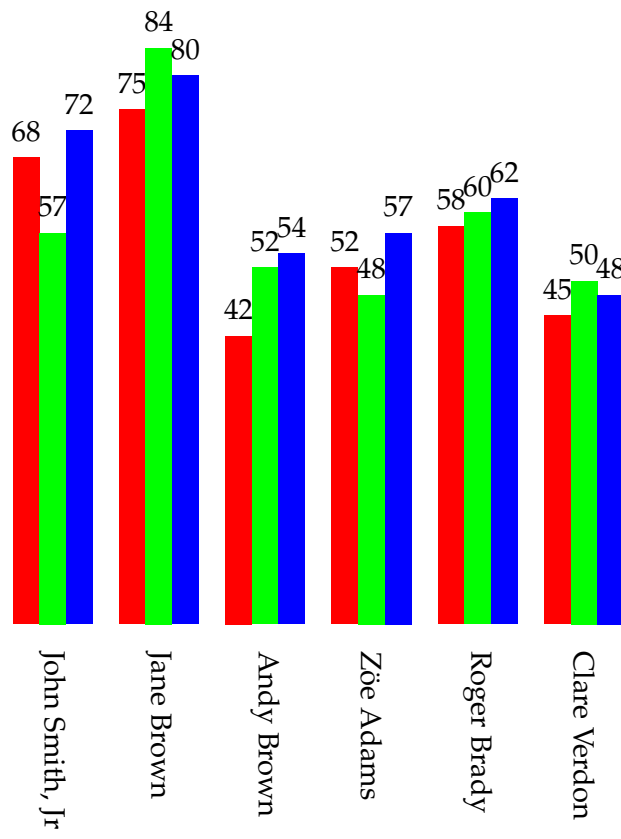


Figure 10.4: Student marks

```

barlabel={\firstname\ \surname}}{marks}
{\surname=Surname,\firstname=FirstName,\assignI=Assignment 1,%
\assignII=Assignment 2,\assignIII=Assignment 3,\theMean=Average}
\caption{Student marks}
\end{figure}

```

which produces **Figure 10.5**. Notes:

1. I've used the TikZ snake library to create a brace, so I need to put

```
\usetikzlibrary{snakes}
```

in the preamble. See the pgf manual for more details on how to use this library.

2. I used `\DTLbargroupwidth` to indicate the width of each bar group.
3. I used `\DTLbarchartwidth` to indicate the width of the entire bar chart

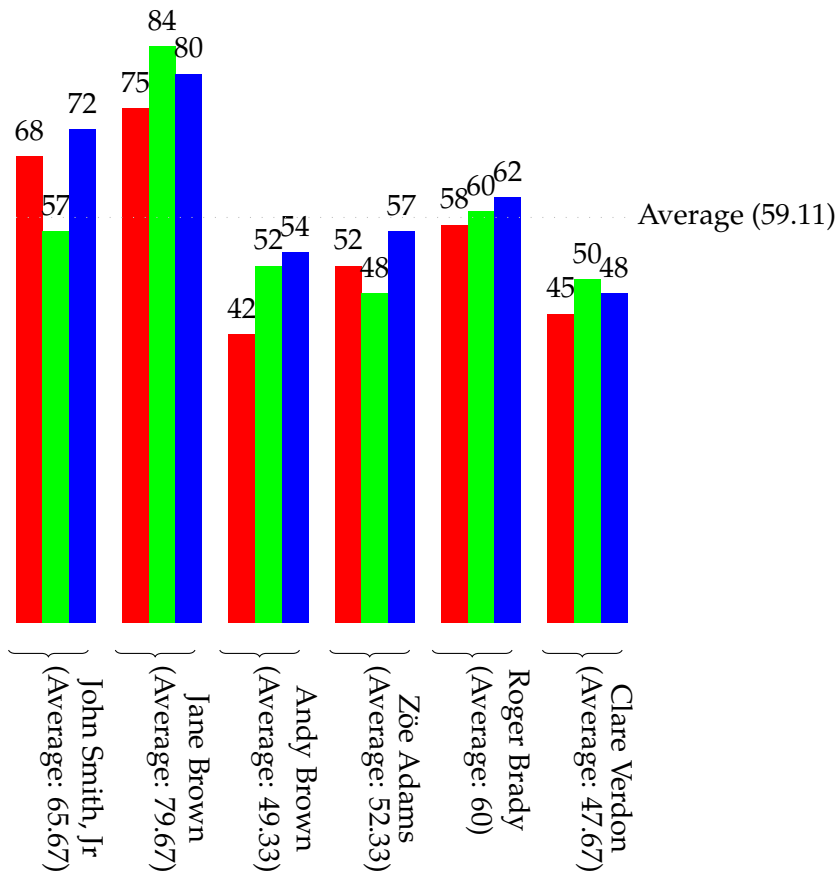


Figure 10.5: Student marks

11 Converting a $\text{BIB}\text{T}_\text{E}\text{X}$ database into a datatool database (databib package)

The databib package provides the means of converting a $\text{BIB}\text{T}_\text{E}\text{X}$ database into a datatool database. The database can then be sorted using `\DTLsort`, described in [section 6.8](#). For example, you may want to sort the bibliography in reverse chronological order. Once you have sorted the bibliography, you can display it using `\DTLbibliography`, described in [section 11.3](#), or you can iterate through the database using `\DTLforeachbibentry`, described in [section 11.5](#).

Note that the databib package is not automatically loaded by datatool, so if you want to use it, you must load it using `\usepackage{databib}`.

The purpose of this package is to provide a means for authors to format their own bibliography style where there is no bibliography style file available that produces the desired results. The `\DTLsort` macro uses a much less efficient sorting algorithm than $\text{BIB}\text{T}_\text{E}\text{X}$, and loading the bibliography as a datatool database is much slower than loading a standard `bb1` file. If you have a large database, and you are worried that $\text{L}\text{A}\text{T}_\text{E}\text{X}$ may have become stuck, try using the verbose option to datatool or use the command `\dtlverbosettrue`. This will print informative messages to the console and transcript file, to let you know what's going on.

11.1 $\text{BIB}\text{T}_\text{E}\text{X}$: An Overview

This document assumes that you have at least some passing familiarity with $\text{BIB}\text{T}_\text{E}\text{X}$, but here follows a brief refresher.

$\text{BIB}\text{T}_\text{E}\text{X}$ is an external application used in conjunction with $\text{L}\text{A}\text{T}_\text{E}\text{X}$. When you run $\text{BIB}\text{T}_\text{E}\text{X}$, you need to specify the name of the document's auxiliary file (without the `aux` extension). $\text{BIB}\text{T}_\text{E}\text{X}$ then reads this file and looks for the commands `\bibstyle` (which indicates which bibliography style (`bst`) file to load), `\bibdata` (which indicates which bibliography database (`bib`) files to load) and `\citation` (produced by `\cite` and `\nocite`, which indicates which entries should be included in the bibliography). $\text{BIB}\text{T}_\text{E}\text{X}$ then creates a file with the extension `bb1` which contains the bibliography, formatted according to the layout defined in the bibliography style file.

In general, given a document called, say, `mydoc.tex`, you will have to perform the following steps to ensure that the bibliography and all citations are up-to-date:

1. `latex mydoc`

This writes the citation information to the auxiliary file. The bibliography currently doesn't exist, so it isn't displayed. Citations will appear in the document as ?? since the internal cross-references don't exist yet.

2. `bibtex mydoc`

This reads the auxiliary file, and creates a file with the extension `bb1` which typically contains the typeset bibliography.

3. `latex mydoc`

Now that the `bb1` file exists, the bibliography can be input into the document. The internal cross-referencing information for the bibliography can now be written to the auxiliary file.

4. `latex mydoc`

The cross-referencing information can be read from the auxiliary file.

11.1.1 BIB_TE_X database

The bibliographic data required by BIB_TE_X must be stored in a file with the extension `bib`, where each entry is stored in the form:

```
@<entry_type>{<cite_key>,  
  <field_name> = "<value>",  
  :  
  <field_name> = "<value>"  
}
```

Note that curly braces `{` and `}` may be used instead of `"` and `"`.

The entry type, given by `<entry_type>` above, indicates the type of document. This may be one of: `article`, `book`, `booklet`, `inbook`, `incollection`, `inproceedings`¹, `manual`, `mastersthesis`, `misc`, `phdthesis`, `proceedings`, `techreport` or `unpublished`.

The `<cite_key>` above is a unique label identifying this entry, and is the label used in the argument of `\cite` or `\nocite`. The available fields depends on the entry type, for example, the field `journal` is required for the `article` entry type, but is ignored for the `inproceedings` entry type. The standard fields are: `address`, `author`, `booktitle`, `chapter`, `edition`, `editor`, `howpublished`, `institution`, `journal`, `key`, `month`, `note`, `number`, `organization`, `pages`, `publisher`, `school`, `series`, `title`, `type`, `volume` and `year`.

Author and editor names must be entered in one of the following ways:

1. `<First names>` `<von part>` `<Surname>`, `<Jr part>`

¹Note that `conference` is a synonym for `inproceedings`.

The *<von part>* is optional and is identified by the name(s) starting with lowercase letters. The final comma followed by *<Jr part>* is also optional. Examples:

```
author = "Henry James de Vere"
```

In the above, the first names are Henry James, the “von part” is de and the surname is Vere. There is no “junior part”.

```
author = "Mary-Jane Brown, Jr"
```

In the above, the first name is Mary-Jane, there is no von part, the surname is Brown and the junior part is Jr.

```
author = "Peter {Murphy Allen}"
```

In the above, the first name is Peter, and the surname is Murphy Allen. Note that in this case, the surname must be grouped, otherwise Murphy would be considered part of the forename.

```
author = "Maria Eliza {\uppercase{d}e La} Cruz"
```

In the above, the first name is Maria Eliza, the von part is De La, and the surname is Cruz. In this case, the von part starts with an uppercase letter, but specifying

```
author = "Maria Eliza De La Cruz"
```

would make $\text{BIB}_{\text{E}}\text{X}$ incorrectly classify “Maria Eliza De La” as the first names, and the von part would be empty. Since $\text{BIB}_{\text{E}}\text{X}$ doesn’t understand $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ commands, using `{\uppercase{d}e La}` will trick $\text{BIB}_{\text{E}}\text{X}$ into thinking that it starts with a lower case letter.

2. *<von part>* *<Surname>*, *<Forenames>*

Again the *<von part>* is optional, and is determined by the case of the first letter. For example:

```
author = "de Vere, Henry James"
```

Multiple authors or editors should be separated by the key word `and`, for example:

```
author = "Michel Goossens and Frank Mittlebach and Alexander Samarin"
```

Below is an example of a book entry:

```
@book{latexcomp,  
  title      = "The \LaTeX\ Companion",  
  author     = "Michel Goossens and Frank Mittlebach and  
              Alexander Samarin",  
  publisher  = "Addison-Wesley",  
  year       = 1994  
}
```

Note that numbers may be entered without delimiters, as in `year = 1994`. There are also some predefined strings, including those for the month names. You should always use these strings instead of the actual month name, as the way the month name is displayed depends on the bibliography style. For example:

```
@article{Cawley2007b,
author = "Gavin C. Cawley and Nicola L. C. Talbot",
title  = "Preventing over-fitting in model selection via {B}ayesian
         regularisation of the hyper-parameters",
journal = "Journal of Machine Learning Research",
volume  = 8,
pages   = "841--861",
month   = APR,
year    = 2007
}
```

You can concatenate strings using the `#` character, for example:

```
month = JUL # "~31~---" # AUG # "~4",
```

Depending on the bibliography style, this may be displayed as: July 31 – August 4, or it may be displayed as: Jul 31 – Aug 4. For further information, see [1].

11.2 Loading a databib database

The `databib` package always requires the `databib.bst` bibliography style file (which is supplied with this bundle). You need to use `\cite` or `\nocite` as usual. If you want to add all entries in the `bib` file to the `datatool` database, you can use `\nocite{*}`.

`\DTLloadbbl`

```
\DTLloadbbl[<bbl name>]{<db name>}{<bib list>}
```

This command performs several functions:

1. it writes the following line in the auxiliary file:

```
\bibstyle{databib}
```

which tells $\text{BIB}_{\text{T}}\text{X}$ to use the `databib.bst` $\text{BIB}_{\text{T}}\text{X}$ style file,

2. it writes `\bibdata{<bib list>}` to the auxiliary file, which tells $\text{BIB}_{\text{T}}\text{X}$ which `bib` files to use,
3. it creates a `datatool` database called *<db name>*,
4. it loads the file *<bbl name>* if it exists. (The value defaults to `\jobname.bbl`, which is the usual name for a `bbl` file.) If the `bbl` file doesn't exist, the database *<db name>* will remain empty.

You then need to run your document through L^AT_EX (or PDFL^AT_EX) and then run B_IB_TE_X on the auxiliary file, as described in [section 11.1](#). This will create a bbl file which contains all the commands required to add the bibliography information to the datatool database called *<db name>*. The next time you L^AT_EX your document, this file will be read, and the information will be added to *<db name>*.

Note that `\DTLloadbbl` doesn't generate any text. Once you have loaded the data, you can display the bibliography using `\DTLbibliography` (described below) or you can iterate through it using `\DTLforeachbibentry` described in [section 11.5](#).

Note that the `datatool.bst` B_IB_TE_X style file provides the following additional fields: `isbn`, `doi`, `pubmed`, `url` and `abstract`. However these fields are ignored by the three predefined `datatool` styles (`plain`, `abbrv` and `alpha`). If you want these fields to be displayed in the bibliography you will need to modify the bibliography style (see [subsection 11.4.1](#)).

11.3 Displaying a datatool database

A `datatool` database which has been loaded using `\DTLloadbbl` (described in [section 11.2](#)) can be displayed using:

`\DTLbibliography`

```
\DTLbibliography[<conditions>]{<db name>}
```

where *<db name>* is the name of the database.

Within the optional argument *<condition>*, you may use any of the commands that may be used within the optional argument of `\DTLforeach`. In addition, you may use the following commands:

`\DTLbibfieldexists`

```
\DTLbibfieldexists{<field label>}
```

This tests whether the field with the given label exists for the current entry. The field label may be one of: `Address`, `Author`, `BookTitle`, `Chapter`, `Edition`, `Editor`, `HowPublished`, `Institution`, `Journal`, `Key`, `Month`, `Note`, `Number`, `Organization`, `Pages`, `Publisher`, `School`, `Series`, `Title`, `Type`, `Volume`, `Year`, `ISBN`, `DOI`, `PubMed`, `Abstract`, `Url` or `Eprints`.

For example, suppose you have loaded a `datatool` database called `mybib` using `\DTLloadbbl` (described in [section 11.2](#)) then the following bibliography will only include those entries which have a `Year` field:

```
\DTLbibliography[\DTLbibfieldexists{Year}]{mybib}
```

`\DTLbibfieldiseq`

```
\DTLbibfieldiseq{<field label>}{<value>}
```

This tests whether the value of the field given by *<field label>* equals *<value>*. If the field doesn't exist for the current entry, this evaluates to false. For example, the following will produce a bibliography which only contains entries which have the `Year` field set to 2004:

```
\DTLbibliography[\DTLbibfieldiseq{Year}{2004}]{mybib}
```

`\DTLbibfieldcontains`

```
\DTLbibfieldcontains{<field label>}{<sub string>}
```

This tests whether the value of the field given by *<field label>* contains *<sub string>*. For example, the following will produce a bibliography which only contains entries where the `author` field contains the name Knuth:

```
\DTLbibliography[\DTLbibfieldcontains{Author}{Knuth}]{mybib}
```

`\DTLbibfieldislt`

```
\DTLbibfieldislt{<field label>}{<value>}
```

This tests whether the value of the field given by *<field label>* is less than *<value>*. If the field doesn't exist for the current entry, this evaluates to false. For example, the following will produce a bibliography which only contains entries whose `Year` field is less than 1983:

```
\DTLbibliography[\DTLbibfieldislt{Year}{1983}]{mybib}
```

`\DTLbibfieldisle`

```
\DTLbibfieldisle{<field label>}{<value>}
```

This tests whether the value of the field given by *<field label>* is less than or equal to *<value>*. If the field doesn't exist for the current entry, this evaluates to false. For example, the following will produce a bibliography which only contains entries whose `Year` field is less than or equal to 1983:

```
\DTLbibliography[\DTLbibfieldisle{Year}{1983}]{mybib}
```

`\DTLbibfieldisgt`

```
\DTLbibfieldisgt{<field label>}{<value>}
```

This tests whether the value of the field given by *<field label>* is greater than *<value>*. If the field doesn't exist for the current entry, this evaluates to false. For example, the

following will produce a bibliography which only contains entries whose Year field is greater than 1983:

```
\DTLbibliography[\DTLbibfieldisgt{Year}{1983}]{mybib}
```

\DTLbibfieldisge

```
\DTLbibfieldisge{<field label>}{<value>}
```

This tests whether the value of the field given by *<field label>* is greater than or equal to *<value>*. If the field doesn't exist for the current entry, this evaluates to false. For example, the following will produce a bibliography which only contains entries whose Year field is greater than or equal to 1983:

```
\DTLbibliography[\DTLbibfieldisge{Year}{1983}]{mybib}
```

Note that \DTLbibliography uses \DTLforeachbibentry (described in [section 11.5](#)) so you may also use test the value of the counter DTLbibrow within *<conditions>*. You may also use the boolean commands defined by the ifthen package, such as \not.

Example 38 (Creating a list of publications since a given year)

Suppose my boss has asked me to produce a list of my publications in reverse chronological order, but doesn't want any publications published prior to the year 2000. I have a file called `nlct.bib` which contains all my publications which I keep in the directory `$HOME/texmf/bibtex/bib/`. I could look through this file, work out the labels for all the publications whose year field is greater or equal to 2000, and create a file with a \nocite command containing all those labels in a comma separated list in reverse chronological order, but I really can't be bothered to do that. Instead, I can create the following document:

```
\documentclass{article}
\usepackage{databib}
\begin{document}
\nocite{*}
\DTLloadbbl{mybib}{nlct}
\DTLsort{Year=descending,Month=descending}{mybib}
\DTLbibliography[\DTLbibfieldisge{Year}{2000}]{mybib}
\end{document}
```

Suppose I save this file as `mypubs.tex`, then I need to do:

```
latex mypubs
bibtex mypubs
latex mypubs
```

Notes:

1. `\nocite{*}` is used to add all the citations in the bibliography file (`nlct.bib` in this case) to the `databib` database.
2. `\DTLloadbbl{mybib}{nlct}` does the following:
 - a) writes the line


```
\bibstyle{databib}
```

 to the auxiliary file. This tells `BIBTEX` to use `databib.bst` (which is supplied with this package). You therefore shouldn't use `\bibliographystyle`.
 - b) writes the line


```
\bibdata{nlct}
```

 to the auxiliary file. This tells `BIBTEX` that the bibliography data is stored in the file `nlct.bib`. Since I have placed this file in `TEX`'s search path, `BIBTEX` will be able to find it.
 - c) creates a `datatool` database called `mybib`.
 - d) if the `bbl` file (`mypubs.bbl` in this example) exists, it loads this file (which adds the bibliography data to the database), otherwise it does nothing further.
3. In my `BIBTEX` database (`nlct.bib` in this example), I have remembered to use the `BIBTEX` month macros: `jan`, `feb` etc. This means that the months are stored in the database in the form `\DTLmonthname{<nn>}`, where `<nn>` is a two digit number from 01 to 12. `\DTLsort` ignores command names when it compares strings, which means I can not only sort by year, but also by month².
4. Once I have loaded and sorted my database, I can then display it using `\DTLbibliography`. This uses the style given by the `databib` style package option, or the `\DTLbibliographystyle` command, both of which are described in [section 11.4](#).
5. I have filtered the bibliography using the optional argument `[\DTLbibfieldisge{Year}{2000}]`, which checks if the year field of the current entry is greater than or equal to 2000. (Note that if an entry has no year field, the condition evaluates to false, and the entry will be omitted from the bibliography.)
6. If the bibliography database is large, sorting and creating the bibliography may take a while. Using `databib` is much slower than using a standard `BIBTEX` style file.

²as long as I haven't put anything before the month name in the bibliography file, e.g. `month = 2 # apr` will sort by 2 03, instead of 03

Example 39 (Creating a list of my 10 most recent publications)

Suppose now my boss has asked me to produce a list of my ten most recent publications (in reverse chronological order). As in the previous example, I have a file called `nlct.bib` which contains all my publications. I can create the required document as follows:

```
\documentclass{article}
\usepackage{databib}
\begin{document}
\nocite{*}
\DTLloadbbl{mybib}{nlct}
\DTLsort{Year=descending,Month=descending}{mybib}
\DTLbibliography[\value{DTLbibrow}<10]{mybib}
\end{document}
```

11.4 Changing the bibliography style

The style of the bibliography produced using `\DTLbibliography` depends on the style package option, or can be set using

```
\DTLbibliographystyle
```

```
\DTLbibliographystyle{<style>}
```

Note that this is *not* the same as `\bibliographystyle`, as the `databib` package uses its custom `databib.bst` bibliography style file.

Example:

```
\usepackage[style=plain]{databib}
```

This sets the plain bibliography style. This is, in fact, the default style, so it need not be specified.

Available styles are: `plain`, `abbrv` and `alpha`. These are similar to the standard `BIBTEX` styles of the same name, but are by no means identical. The most notable difference is that these styles do not sort the bibliography. It is up to you to sort the bibliography using `\DTLsort` (described in [section 6.8](#)).

11.4.1 Modifying an existing style

This section describes some of the commands which are used to format the bibliography. You can choose whichever predefined style best fits your required style, and then modify the commands described in this section. A description of the remaining commands not listed in this section can be found in [section 6.4](#), [section 6.5](#) and [section 6.6](#).

`\DTLformatauthor`

```
\DTLformatauthor{\von part}{\surname}{\jr part}{\forenames}
```

`\DTLformateditor`

```
\DTLformateditor{\von part}{\surname}{\jr part}{\forenames}
```

These commands are used to format an author/editor's name, respectively. The list of authors and editors are stored in the databib database as a comma separated list of `{\von part}{\surname}{\jr part}{\forenames}` data. This ensures that when you sort on the Author or Editor field, the names will be sorted by the first author or editor's surname.

Within `\DTLformatauthor` and `\DTLformateditor`, you may use the following commands:

`\DTLformatforenames`

```
\DTLformatforenames{\forenames}
```

This is used by the `plain` style to display the author's forenames³.

`\DTLformatabbrvforenames`

```
\DTLformatabbrvforenames{\forenames}
```

This is used by the `abbrv` style to display the author's initials (which are determined from `\forenames`). Note that if any of the authors has a name starting with an accent, the accented letter must be grouped in order for this command to work. For example:

```
author = "{\E}lise {\E}awyn Edwards",
```

The initials are formed using `\DTLstoreinitials` described in [chapter 4](#), so if you want to change the way the initials are displayed (e.g. put a space between them) you will need to redefine the commands used by `\DTLstoreinitials` (such as `\DTLbetweeninitials`).

`\DTLformatsurname`

```
\DTLformatsurname{\surname}
```

This displays its argument by default⁴.

`\DTLformatvon`

```
\DTLformatvon{\von part}
```

³It also checks whether `\forenames` ends with a full stop using `\DTLcheckendsperiod` to prevent a sentence ending full stop from following an abbreviation full stop

⁴It also checks whether the surname ends with a full stop using `\DTLcheckendsperiod`

If the *von part* is empty, this command does nothing, otherwise it displays its argument followed by a non-breakable space.

`\DTLformatjr`

```
\DTLformatjr{<jr part>}
```

If the *jr part* is empty, this command displays nothing, otherwise it displays a comma followed by its argument⁵.

For example, suppose you want the author's surname to appear first in small capitals, followed by a comma and the forenames. This can be achieved by redefining `\DTLformatauthor` as follows:

```
\renewcommand*{\DTLformatauthor}[4]{%
\textsc{\DTLformatvon{#1}}%
\DTLformatsurname{#2}\DTLformatjr{#3}},
\DTLformatforenames{#4}%
}
```

`DTLmaxauthors`

```
DTLmaxauthors
```

The counter `DTLmaxauthors` is used to determine the maximum number of authors to display for a given entry. If the entry's author list contains more than that number of authors, `\etalname` is used, the definition of which is given in [section 6.4](#). The default value of `DTLmaxauthors` is 10.

`DTLmaxeditors`

```
DTLmaxeditors
```

The `DTLmaxeditors` counter is analogous to the `DTLmaxauthors` counter. It is used to determine the maximum number of editor names to display. The default value of `DTLmaxeditors` is 10.

`\DTLlandlast` Within a list of author or editor names, `\DTLlandlast` is used between the last two names, otherwise `\DTLlandnotlast` is used between names. However, if there are only two author or editor names, `\DTLtwoand` is used instead of `\DTLlandlast`.

`\DTLbibitem` The command `\DTLbibitem` is used at the start of each bibliography item. It uses `\bibitem` to provide a marker, such as [1], and writes the citation information to the `.aux` file.

`\DTLmbibitem` The command `\DTLmbibitem` is analogous to `\DTLbibitem` but is for use with `\DTLmbibliography`.

`\DTLendbibitem` The command `\DTLendbibitem` is a hook provided to add additional information at the end of each bibliography item. This does nothing by default, but if you want to display the additional fields provided by the `datbib.bst` style file, you can

⁵again, it also checks *jr part* to determine if it ends with a full stop

redefine `\DTLendbibitem` so that it displays a particular field, if it is defined. Within this command, you may use the commands `\DTLbibfield`, `\DTLifbibfieldexist` and `\DTLifanybibfieldexist`, which are described in [section 11.5](#). For example, if you have used the `abstract` field in any of your entries, you can display the abstract as follows:

```
\renewcommand{\DTLendbibitem}{%
\DTLifbibfieldexist{Abstract}{\DTLpar\textbf{Abstract}
\begin{quote}\DTLbibfield{Abstract}\end{quote}}{}}
```

(Note that `\DTLpar` needs to be used instead of `\par`.)

Example 40 (Compact bibliography)

Suppose I don't have much space in my document, and I need to produce a compact bibliography. Firstly, I can use the bibliography style `abbrv`, either through the package option:

```
\usepackage[style=abbrv]{datbib}
```

or using:

```
\DTLbibliographystyle{abbrv}
```

Once I have set the style, I can further modify it thus:

```
\renewcommand*{\andname}{\&}
\renewcommand*{\editorname}{ed.}
\renewcommand*{\editorsname}{eds.}
\renewcommand*{\pagesname}{pp.}
\renewcommand*{\pagename}{p.}
\renewcommand*{\volumename}{vol.}
\renewcommand*{\numbername}{no.}
\renewcommand*{\editionname}{ed.}
\renewcommand*{\techreportname}{T.R.}
\renewcommand*{\mscthesistname}{MSc thesis}
```

Now I can load⁶ and display the bibliography:

```
% create a database called mybib from the information given
% in mybib1.bib and mybib2.bib
\DTLloadbbl{mybib}{mybib1,mybib2}
% display the bibliography
\DTLbibliography{mybib}
```

⁶I can load the bibliography earlier, but obviously the bibliography should only be displayed after the bibliography styles have been set, otherwise they will have no effect

Example 41 (Highlighting a given author)

Suppose my boss wants me to produce a list of all my publications (which I have stored in the file `nlct.bib`, as in [example 38](#)). Most of my publications have multiple co-authors, but suppose my boss would like me to highlight my name so that when he skims through the document, he can easily see my name in the list of co-authors. I can do this by redefining `\DTLformatauthor` so that it checks if the given surname matches mine. (This assumes that none of the other co-author's share my surname.)

```
\renewcommand*\DTLformatauthor}[4]{%
{\DTLifstringeq{#2}{Talbot}{\bfseries }}}%
\DTLformatforenames{#4}
\DTLformatvon{#1}%
\DTLformatsurname{#2}%
\DTLformatjr{#3}}
```

Notes:

1. I have used `\DTLifstringeq` (described in [section 2.1](#)) to perform the string comparison.
2. If one or more of my co-authors shared the same surname as me, I would also have had to check the first name, however there is regrettably a lack of consistency in my `bib` file when it comes to my forenames. Sometimes my name is given as Nicola L. C. Talbot, sometimes the middle initials are omitted, Nicola Talbot, or sometimes, just initials are used, N. L. C. Talbot. This can cause problems when checking the forenames, but as long as the other authors who share the same surname as me, don't also share the same first initial, I can use `\DTLifStartsWith` or `\DTLisPrefix`, which are described in [section 2.1](#) and [section 2.2](#), respectively. Using the first approach I can do:

```
\renewcommand*\DTLformatauthor}[4]{%
{\DTLifstringeq{#2}{Talbot}{\DTLifStartsWith{#4}{N}{\bfseries }}}}}%
\DTLformatforenames{#4}
\DTLformatvon{#1}%
\DTLformatsurname{#2}%
\DTLformatjr{#3}}
```

Using the second approach I can do:

```
\renewcommand*\DTLformatauthor}[4]{%
{\ifthenelse{\DTLiseq{#2}{Talbot}\and
\DTLisPrefix{#4}{N}}{\bfseries }}}%
\DTLformatforenames{#4}
\DTLformatvon{#1}%
\DTLformatsurname{#2}%
\DTLformatjr{#3}}
```

3. I have used a group to localise the effect of `\bfseries`.

11.5 Iterating through a databib database

`\DTLbibliography` (described in [section 11.3](#)) may still not meet your needs. For example, you may be required to list journal papers and conference proceedings in separate sections. In which case, you may find it easier to iterate through the bibliography using:

`\DTLforeachbibentry`

```
\DTLforeachbibentry[<condition>]{<db name>}{<text>}
```

`\DTLforeachbibentry*`

```
\DTLforeachbibentry*[<condition>]{<db name>}{<text>}
```

This iterates through the databib database called *<db name>* and does *<text>* if *<condition>* is met. As with `\DTLforeach`, the starred version is read-only.

`\DTLforeachbibentry` only makes local assignments, which means that it's unsuitable to display the references in a tabular-like environment (for example, the `europcv` environment provided by the `europcv` class). It's also a short command, so *<text>* can't contain any paragraph breaks. Instead you can use the analogous commands:

`\gDTLforeachbibentry`

```
\gDTLforeachbibentry[<condition>]{<db name>}{<text>}
```

`\gDTLforeachbibentry*`

```
\gDTLforeachbibentry*[<condition>]{<db name>}{<text>}
```

For each row of the database, the following commands are set:

- `\DBIBcitekey` • `\DBIBcitekey` This is the unique label which identifies the current entry (as used in the argument of `\cite` and `\nocite`).
- `\DBIBentrytype` • `\DBIBentrytype` This is the current entry type, and will be one of: `article`, `book`, `booklet`, `inbook`, `incollection`, `inproceedings`, `manual`, `mastersthesis`, `misc`, `phdthesis`, `proceedings`, `techreport` or `unpublished`. (Note that even if you used the entry type `conference` in your bib file, its entry type will be set to `inproceedings`).

The remaining fields may be accessed using:

`\DTLbibfield`

```
\DTLbibfield{<field label>}
```

where *⟨field label⟩* may be one of: Address, Author, BookTitle, Chapter, Edition, Editor, HowPublished, Institution, Journal, Key, Month, Note, Number, Organization, Pages, Publisher, School, Series, Title, Type, Volume, Year, ISBN, DOI, PubMed, Abstract or Url.

Alternatively, you can assign the value of a field to a control sequence *⟨cs⟩* using:

`\DTLbibfieldlet`

```
\DTLbibfieldlet{⟨cs⟩}{⟨field label⟩}
```

You can determine if a field exists for a given entry using

`\DTLifbibfieldexists`

```
\DTLifbibfieldexists{⟨field label⟩}{⟨true part⟩}{⟨false part⟩}
```

If the field given by *⟨field label⟩* exists for the current bibliography entry, it does *⟨true part⟩*, otherwise it does *⟨false part⟩*.

`\DTLifbibanyfieldexists`

```
\DTLifanybibfieldexists{⟨field label list⟩}{⟨true part⟩}{⟨false part⟩}
```

This is similar to `\DTLifbibfieldexists` except that the first argument is a list of field names. If one or more of the fields given in *⟨field label list⟩* exists for the current bibliography item, this does *⟨true part⟩*, otherwise it does *⟨false part⟩*.

`\DTLformatbibentry`

```
\DTLformatbibentry
```

This formats the bibliography entry for the current row. It checks for the existence of the command `\DTLformat⟨entry type⟩`, where *⟨entry type⟩* is given by `\DBIBentrytype`. These commands are defined by the bibliography style. There is also a version for use with `\gDTLforeachbibentry`:

`\gDTLformatbibentry`

```
\gDTLformatbibentry
```

It's also possible to use `\DTLformatbibentry` for a specific key, rather than using it within `\DTLforeachbibentry` using:

```
\DTLformatthisbibentry{⟨db⟩}{⟨cite key⟩}
```

where *⟨db⟩* is the database name and *⟨cite key⟩* is the citation label. Note that none of these three commands use `\bibitem`. You can manually insert `\bibitem{⟨cite key⟩}`

in front of the command, or you can use:

```
\DTLcustombibitem{<marker code>}{<ref text>}{<cite key>}
```

This is like `\bibitem[<text>]{<cite key>}` except that it uses `<marker code>` instead of `\item[<text>]` and it uses `<ref text>` instead of `\the\value{\@listctr}`.

`\DTLcomputewidestbibentry`

```
\DTLcomputewidestbibentry{<conditions>}{<db name>}{<bib label>}
{<cmd>}
```

This computes the widest bibliography entry over all entries satisfying `<conditions>` in the database `<db name>`, where the label is given by `<bib label>`, and the result is stored in `<cmd>`, which may then be used in the argument of the `thebibliography` environment.

`DTLbibrow`

The counter `DTLbibrow` keeps track of the current bibliography entry. This is reset at the start of each `\DTLforeachbibentry` and is incremented if `<conditions>` is met.

Within the optional argument `<condition>`, you may use any of the commands that may be used within the optional argument of `\DTLbibliography`, described in [section 11.3](#).

Example 42 (Separate List of Journals and Conference Papers)

Suppose now my boss has decided that I need to produce a list of all my publications, but they need to be separated so that all the journal papers appear in one section, and all the conference papers appear in another section. The journal papers need to be labelled [J1], [J2] and so on, while the conference papers need to be labelled [C1], [C2] and so on. (My boss isn't interested in any of my other publications!) Again, all my publications are stored in the `BIBTEX` database `nlct.bib`. The following creates the required document:

```
\documentclass{article}
\usepackage{databib}
\begin{document}
\nocite{*}
\DTLloadbbl{mybib}{nlct}

\renewcommand*\refname{Journal Papers}
\DTLcomputewidestbibentry{\equal{\DBIBentrytype}{article}}
{mybib}{J\theDTLbibrow}{\widest}

\begin{thebibliography}{\widest}
\DTLforeachbibentry[\equal{\DBIBentrytype}{article}]{mybib}{%
\bibitem[J\theDTLbibrow]{\DBIBCitekey} \DTLformatbibentry}
\end{thebibliography}
```

```

\renewcommand*{\refname}{Conference Papers}
\DTLcomputewidestbibentry{\equal{\DBIBentrytype}{inproceedings}}
{mybib}{C\theDTLbibrow}{\widest}

\begin{thebibliography}{\widest}
\DTLforeachbibentry[\equal{\DBIBentrytype}{inproceedings}]{mybib}{%
\bibitem[C\theDTLbibrow]{\DBIBCitekey} \DTLformatbibentry}
\end{thebibliography}

\end{document}

```

11.6 Multiple Bibliographies

It is possible to have more than one bibliography in a document, but it then becomes necessary to have a separate auxiliary file for each bibliography, and each auxiliary file must then be passed to $\text{BIB}_{\text{T}}\text{X}$. In order to do this, you need to use

`\DTLmultibibs`

```
\DTLmultibibs{<name list>}
```

where *<name list>* is a comma separated list of names, *<name>*. For each *<name>*, this command creates an auxiliary file called *<name>.aux* (note that this command may only be used in the preamble).

When you want to cite an entry for a given bibliography named in `\DTLmultibibs`, you must use:

`\DTLcite`

```
\DTLcite[<text>]{<mbib>}{<cite key list>}
```

This is analogous to `\cite[<text>]{<cite key list>}`, but writes the `\citation` command to *<mbib>.aux* instead of to the document's main auxiliary file. It also ensures that the cross-referencing labels are based on *<mbib>*, to allow you to have the same reference in more than one bibliography without incurring a "multiply defined" warning message. Note that you can still use `\cite` to add citation information to the main auxiliary file.

If you want to add an entry to the bibliography without producing any text, you can use

`\DTLnocite`

```
\DTLnocite{<mbib>}{<cite key list>}
```

which is analogous to `\nocite{<cite key list>}`, where again the citation information is written to *<mbib>.aux* instead of the document's main auxiliary file.

Note that for both `\DTLcite` and `\DTLnocite` the `<mbib>` part must be one of the names listed in `\DTLmultibibs`.

`\DTLloadmdbl`

```
\DTLloadmdbl{<mbib>}{<db name>}{<bib list>}
```

This is analogous to `\DTLloaddbbl{<db name>}{<bib list>}` described in [section 11.2](#). (Again `<mbib>` must be one of the names listed in `\DTLmultibibs`.) This creates a new datatool database called `<db name>` and loads the bibliography information from `<mbib>.bbl` (if it exists).

`\DTLmbibliography`

```
\DTLmbibliography[<condition>]{<mbib>}{<db name>}
```

This is analogous to `\DTLbibliography[<condition>]{<db name>}`, but is required when displaying a bibliography in which elements have been cited using `\DTLcite` and `\DTLnocite`.

Example 43 (Multiple Bibliographies)

Suppose I need to create a document which contains a section listing all my publications, but I also need to have separate sections covering each of my research topics, with a mini-bibliography at the end of each section. As in the earlier examples, all my publications are stored in the file `nlct.bib` which is somewhere on TeX's path. Note that there will be some duplication as the references in the mini-bibliographies will also appear in the main bibliography at the end of the document, but using `\DTLcite` and `\DTLmbibliography` ensures that all the cross-referencing labels (and hyperlinks if they are enabled) are unique.

```
\documentclass{article}
\usepackage{datatool}
\DTLmultibibs{kernel, food}
\begin{document}
\section{Kernel methods}
In this section I'm going to describe some research work into
kernel methods, and in the process I'm going to cite some related
papers \DTLcite{kernel}{Cawley2007a,Cawley2006a}.
```

```
\DTLloadmdbl{kernel}{kernelDB}{nlct}
\DTLmbibliography{kernel}{kernelDB}
```

```
\section{Food research}
```

```
In this section I'm going to describe some research work
in the area of food safety, and in the process, I'm going
to cite some related papers \DTLcite{food}{Peck1999,Barker1999a}
```

```

\DTLloadmdbl{food}{foodDB}{nlct}
\DTLmbibliography{food}{foodDB}

\cite{*}
\renewcommand{\refname}{Complete List of Publications}
\DTLloaddbl{fullDB}{nlct}
\DTLbibliography{fullDB}
\end{document}

```

Notes:

1. This will create the files `kernel.aux` and `food.aux`. These will have to be passed to **BIBTEX**, in addition to the documents main auxiliary file. So, if my document is called `researchwork.tex`, then I need to do:

```

latex researchwork
bibtex researchwork
bibtex kernel
bibtex food
latex researchwork
latex researchwork

```

2. `\cite{*}` is used to add all the entries in the bib file to the main bibliography database. As before, `\DTLloaddbl` and `\DTLbibliography` are used to load and display the main bibliography.

Don't try to directly input the `.bbl` file using `\input` (or `\include`) instead of using `\DTLloaddbl` or `\DTLloadmdbl` as these commands store the name of the required database and initialise the database before loading the `.bbl` file. Similarly, don't just copy the contents of the `.bbl` file into your document without first defining the database using `\DTLnewdb` and setting `\DTLBIBdbname` to the name of the database.

12 Referencing People (person package)

Sometimes when mail-merging, it may be necessary to reference a person by their pronoun which can lead to the cumbersome and impersonal “he/she” construct. The `person` package allows you to define a person by their full name, familiar name and gender. You can then use the commands described in [section 12.2](#) to produce the appropriate pronoun.

This can also be useful for other types of documents, such as an order of service for a baptism or funeral. Since the document is much the same from one person to the next, documents of this nature are frequently simply copied and a search and replace edit is used to change the relevant text. However this can lead to errors (especially if the previous person’s name was Mary!) With the `person` package, you need only change the definition of the person by modifying the arguments of `\newperson`.

12.1 Defining and undefining People

A person is defined (globally) using the command:

`\newperson`

```
\newperson[⟨label⟩]{⟨full name⟩}{⟨familiar name⟩}{⟨gender⟩}
```

The optional argument is a unique label identifying this person, in the event that there is more than one person. If `⟨label⟩` is omitted `anon` is used. (This is also the case for subsequent commands that take an optional label.) The gender may be any of those given by

`\malelabels`

```
\malelabels
```

or

`\femalelabels`

```
\femalelabels
```

The default definition of `\malelabels` is `male, Male, MALE, M, m` and the default definition of `\femalelabels` is `female, Female, FEMALE, F, f`. You can add extra identifiers using

`\addmalelabel`


```
\addmalelabel{\langle identifier \rangle}
```

or

```
\addfemalelabel
```

```
\addfemalelabel{\langle identifier \rangle}
```

For example:

```
\addmalelabel{boy}  
\addfemalelabel{girl}
```

The total number of defined people is given by:

```
\thepeople
```

```
\thepeople
```

A person can be undefined using:

```
\removeperson
```

```
\removeperson[\langle label \rangle]
```

where the person is given by $\langle label \rangle$.

If more than one person has been defined, they can all be removed using:

```
\removeallpeople
```

```
\removeallpeople
```

or you can remove a subset using:

```
\removepeople
```

```
\removepeople{\langle list \rangle}
```

where $\langle list \rangle$ is a comma-separated list of labels.

12.2 Displaying Information

Once a person has been defined, you can display their name using:

```
\personfullname
```

```
\personfullname[\langle label \rangle]
```

where $\langle label \rangle$ is the unique label used in the optional argument to `\newperson`. The person's familiar name is displayed using:

`\personname`

```
\personname[\label]
```

The person's pronoun ("he" or "she") is displayed using:

`\personpronoun`

```
\personpronoun[\label]
```

The objective pronoun ("him" or "her") is displayed using:

`\personobjpronoun`

```
\personobjpronoun[\label]
```

The possessive adjective ("his" or "her") is displayed using:

`\personpossadj`

```
\personpossadj[\label]
```

The possessive pronoun "his" or "hers" is displayed using:

`\personposspronoun`

```
\personposspronoun[\label]
```

The person's relationship to their parent ("son" or "daughter") is displayed using:

`\personchild`

```
\personchild[\label]
```

The person's relationship to their child ("mother" or "father") is displayed using:

`\personparent`

```
\personparent[\label]
```

The person's relationship to their sibling ("brother" or "sister") is displayed using:

`\personsibling`

```
\personsibling[\label]
```

If the word occurs at the start of a sentence, you will need one of the following commands, which are as the above, except the first letter is converted to upper case:

`\Personpronoun`

```
\Personpronoun[\label]
```

`\Personobjpronoun`

```
\Personobjpronoun[⟨label⟩]
```

`\Personpossadj`

```
\Personpossadj[⟨label⟩]
```

`\Personposspronoun`

```
\Personposspronoun[⟨label⟩]
```

`\Personchild`

```
\Personchild[⟨label⟩]
```

`\Personparent`

```
\Personparent[⟨label⟩]
```

`\Personsisbling`

```
\Personsisbling[⟨label⟩]
```

Example 44 (Order of Service (Memorial))

This example is for a memorial order of service.

```
\documentclass{article}
```

```
\usepackage{person}
```

```
\newperson{Jane Doe}{Jane}{female}
```

```
\begin{document}
```

```
\begin{center}
```

```
\Large
```

```
In Memory of \personfullname
```

```
\end{center}
```

```
We are gathered here to remember our \personsisbling\ \personname.
```

```
\Personpronoun\ will be much missed, and \personpossadj\
```

```
family are in our prayers.
```

```
\end{document}
```

In Memory of Jane Doe

We are gathered here to remember our sister Jane. She will be much missed, and her family are in our prayers.

If there is more than one person, you will need to use the optional argument *<label>* to `\newperson` to uniquely identify each person. You can then list all of the people's full or familiar names using:

`\peoplefullname`

```
\peoplefullname
```

`\peoplename`

```
\peoplename
```

Note that if there is only one person defined, these commands behave the same as `\personfullname [<label>]` and `\personname [<label>]`.

Similarly for the pronouns:

`\peoplepronoun`

```
\peoplepronoun
```

`\Peoplepronoun`

```
\Peoplepronoun
```

`\peopleobjpronoun`

```
\peopleobjpronoun
```

`\Peopleobjpronoun`

```
\Peopleobjpronoun
```

`\peoplepossadj`

```
\peoplepossadj
```

`\Peoplepossadj`

```
\Peoplepossadj
```

`\peopleposspronoun`

```
\peopleposspronoun
```

`\Peopleposspronoun`

```
\Peopleposspronoun
```

where, again, if only one person has been defined, each of these commands is equivalent to `\person... [⟨label⟩]` or `\Person... [⟨label⟩]`. If more than one person has been defined, these commands will display they/them/their/theirs or They/Them/Their/Theirs, as appropriate.

Likewise for relationship commands:

`\peoplechild`

```
\peoplechild
```

`\Peoplechild`

```
\Peoplechild
```

`\peopleparent`

```
\peopleparent
```

`\Peopleparent`

```
\Peopleparent
```

`\peoplesibling`

```
\peoplesibling
```

`\Peoplesibling`

```
\Peoplesibling
```

Example 45 (Order of Service (Baptism))

In this example two people are defined.

```
\documentclass{article}

\usepackage{person}

\newperson[john]{John Joseph}{John}{male}
\newperson[jane]{Jane Mary}{Jane}{female}

\begin{document}
\begin{center}
\Large
Baptism of \peoplefullname.
```

```
\end{center}
```

```
Today we welcome \peoplename\ into God's family, may He guide
and protect \peopleobjpronoun.
\end{document}
```

This produces the following text:

Baptism of John Joseph and Jane Mary.

Today we welcome John and Jane into God's family, may He guide and protect them.

Example 46 (Mail Merging Using Appropriate Gender)

In this example I have a CSV file called `students.csv` containing the following:

```
FirstName, Surname, Gender, Parent, Address
John, "Smith, Jr", M, Mr and Mrs Smith, 1 The Street\\Newtown
Jane, Brown, F, Ms Brown, 2 The Avenue\\Oldtown
Andy, Brown, male, Mr Brown and Miss Sepia, 3 The Road\\Newtown
Z\oe, Adams, f, Mr and Mrs Adams, 5 The Street\\Newtown
Roger, Brady, m, Mrs Brady, 6 The Avenue\\Oldtown
Clare, Vernon, female, Mr Vernon, 7 The Close\\Anytown
```

Suppose I have to write to each student's parents regarding their child. I can load the information using `\DTLloaddb` (described in [section 6.2](#)). I can then iterate through the database and define the student as a person and use the commands defined in the person package to display the correct gender related text. I could give each person a unique label based on the row count (`\DTLcurrentindex`), but since I don't need to reuse the information, I can use the default `anon` label and undefine the person when no longer required.

Note that in the CSV file, the gender label isn't consistent. For some students the gender is identified by a single letter ("m" or "f") and for others the gender is identified by a complete word ("male" or "female"). There's also no regard for case. This doesn't matter to `\newperson` as all the identifiers used are listed in `\malelabels` and `\femalelabels`.

The following is an example letter sent to all parents:

```
\documentclass{letter}
\usepackage{person}

load student information from file "students.csv"
\DTLloaddb{students}{students.csv}
\begin{document}
Iterate through the student database:
```

```

\DTLforeach{students}{\FirstName=FirstName,\Surname=Surname,%
\Gender=Gender,\Parent=Parent,\Address=Address}{%
  Define "anon":
    \newperson{\FirstName\space\Surname}{\FirstName}{\Gender}%
  Do the letter:
    \begin{letter}{\Parent\\\Address}
    \opening{Dear \Parent}
      Your \personchild\ \personname\ has been awarded a
      place. We look forward to seeing \personobjpronoun\
      on \personpossadj\ arrival.
    \closing{Yours Sincerely}
    \end{letter}
  Undefine "anon":
    \removeperson
}
\end{document}

```

The body of the first letter appears as follows:

Your son John has been awarded a place. We look forward to seeing him on his arrival.

Whereas the body of the second letter appears as follows:

Your daughter Jane has been awarded a place. We look forward to seeing her on her arrival.

12.3 Advanced Commands

This section describes additional commands provided by the person package. More detail can be found in the documented code (datatool-code.pdf).

12.3.1 Conditionals

`\ifpersonexists`

```
\ifpersonexists{<label>}{<true part>}{<>false part>}
```

Tests if the person identified by *<label>* has been defined. If true, do *<true part>* otherwise do *<>false part>*.

`\ifmale`

```
\ifmale{<label>}{<true part>}{<>false part>}
```

Test if the person identified by $\langle label \rangle$ is male. If true, do $\langle true part \rangle$ otherwise do $\langle false part \rangle$.

`\iffemale`

```
\iffemale{\langle label \rangle}{\langle true part \rangle}{\langle false part \rangle}
```

Test if the person identified by $\langle label \rangle$ is female. If true, do $\langle true part \rangle$ otherwise do $\langle false part \rangle$.

`\ifallmale`

```
\ifallmale[\langle label list \rangle]{\langle true part \rangle}{\langle false part \rangle}
```

Tests if all the people listed in $\langle label list \rangle$ are male. If true, do $\langle true part \rangle$ otherwise do $\langle false part \rangle$. If $\langle label list \rangle$ is omitted, applied to all defined people.

`\ifallfemale`

```
\ifallfemale[\langle label list \rangle]{\langle true part \rangle}{\langle false part \rangle}
```

Likewise to test if all the people tested are female.

To determine if a string is an allowed male label:

`\ifmalelabel`

```
\ifmalelabel{\langle identifier \rangle}{\langle true part \rangle}{\langle false part \rangle}
```

where $\langle identifier \rangle$ is the string to be tested. If true, do $\langle true part \rangle$ otherwise do $\langle false part \rangle$. For example:

```
\def\gender{M}
\ifmalelabel{\gender}{male}{not male}
```

Similarly to for an allowed female label:

`\iffemalelabel`

```
\iffemalelabel{\langle identifier \rangle}{\langle true part \rangle}{\langle false part \rangle}
```

For example:

```
\ifmalelabel{\gender}{Male}{%
  \iffemalelabel{\gender}{Female}%
  {Undefined Gender}%
}
```

12.3.2 Iterating Through Defined People

You can iterate through all defined people using:

`\foreachperson`

```
\foreachperson(\langle name cs \rangle, \langle full name cs \rangle, \langle gender cs \rangle, \langle label cs \rangle) \do{\langle body \rangle}
```

At each iteration, $\langle name cs \rangle$, $\langle full name cs \rangle$, $\langle gender cs \rangle$ and $\langle label cs \rangle$ are set to the current person's name, full name, gender and label, respectively. (These arguments must all be command names.) Note that the gender is set to the definition of `\malename` or `\femalename`, as appropriate.¹ Once these commands are set, $\langle body \rangle$ is applied.

If you only want to iterate through a subset of defined people, you can use:

```
\foreachperson(\langle name cs \rangle, \langle full name cs \rangle, \langle gender cs \rangle, \langle label cs \rangle) \in{\langle list \rangle} \do{\langle body \rangle}
```

where $\langle list \rangle$ is a comma-separated list of labels.

12.3.3 Accessing Individual Information

`\getpersongender`

```
\getpersongender{\langle cs \rangle}{\langle label \rangle}
```

Gets the gender of the person identified by $\langle label \rangle$ and stores in $\langle cs \rangle$ (which must be a command name). This sets $\langle cs \rangle$ to the definition of `\malename` or `\femalename` as appropriate.

`\getpersonname`

```
\getpersonname{\langle cs \rangle}{\langle label \rangle}
```

Gets the name of the person identified by $\langle label \rangle$ and stores in $\langle cs \rangle$ (which must be a command name).

`\getpersonfullname`

```
\getpersonfullname{\langle cs \rangle}{\langle label \rangle}
```

Gets the full name of the person identified by $\langle label \rangle$ and stores in $\langle cs \rangle$ (which must be a command name).

¹Predefined names provided by the person package are described in the documented code (datatool-code.pdf).

Bibliography

- [1] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The L^AT_EX Companion*. Addison-Wesley, 1994.

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Index

Symbols	
\\	58
A	
\Acr	131
\acr	130
\acronymfont	116, 130
\Acrpl	131
\acrpl	130
\addfemalelabel	201
\addmalelabel	200
\alpha	116, 117
\andname	36, 116
\appto	122
B	
beamer class	131
booktabs package	55, 62, 63
\bottomrule	55, 63
C	
\capitalisewords	129, 130, 133
\chapter	135
colortbl package	64
counters:	
DTLbarroundvar	172
DTLbibrow	196
DTLmaxauthors	191
DTLmaxeditors	191
DTLpierroundvar	147
DTLplotroundXvar	164
DTLplotroundYvar	164
DTLrowi	58
DTLrowii	58
DTLrowiii	58
D	
databar package	ii, 2, 3, 169
databib package	ii, 2, 3, 181, 184, 185, 188–190, 194
datagidx package	ii, 2, 3, 85, 112, 113, 116, 138
\datagidxdictindent	136
datapie package	ii, 2, 3, 141, 149
dataplot package	ii, 2, 3, 153
datatool package	ii, 2, 3, 22, 24, 25, 27, 32, 41, 43–45, 50, 59, 73, 77, 85, 102, 112, 138, 141, 153, 161, 169, 181, 184, 185, 188, 198
datatool-base package	ii, 2, 4, 5, 22, 23, 85, 137
datatool-fp package	ii, 2, 3, 23
datatool-pgfmath package	ii, 2, 3, 23
\datatoolparenstart	83
\datatoolpersoncomma	83, 119
\datatoolplacecomma	83
\datatoolsubjectcomma	83
datatooltk	i, 41, 44, 71, 82, 94, 95, 112, 113
\DBIBCitekey	194
\DBIBentrytype	194
\def	122
\dltcompare	86
\dotfill	132
\DTLabs	26
\DTLadd	24, 78
\DTLaddall	24
\DTLaddcolumn	44
\DTLaddentryforrow	44
\DTLaddtoplotlegend	161
\dtlaftercols	53
\DTLafterinitialbeforehyphen	34
\DTLafterinitials	34
\dtlafterrow	101
\DTLlandlast	191
\DTLlandname	36
\DTLlandnotlast	191
\dtlappendentrytocurrentrow	102
\DTLappendtorow	75
\DTLassign	98
\DTLbaratbegintikz	173
\DTLbaratendtikz	173
\DTLbarchart	169
\DTLbarchart options	
axes	170
barlabel	170
length	170

max	170, 177	\dtlcurrencyalign	52
maxdepth	170, 177	\dtlcurrencyformat	54
upperbarlabel	170	\DTLcurrencytype	96
variable	170	\DTLcurrentindex	58, 206
verticalbars	171, 173, 174	\dtlcurrentrow	100
ylabel	171	\dtldbname	101
yticgap	170	\DTLdecimaltocurrency	23, 77
yticlabels	170	\DTLdecimaltolocale	22, 77
yticpoints	170	\dtldefaultkey	45
\DTLbarchartlength	172	\DTLdeletedb	95
\DTLbarchartwidth	177, 180	\dtldisableUTFviii	85
\DTLbardisplayYticklabel	174	\dtldisplayafterhead	54
\DTLbargroupwidth	180	\dtldisplayacr	54
\DTLbarlabeloffset	172	\DTLdisplaydb	50
\DTLbarmax	177	\dtldisplayendtab	54
\DTLbaroutlinecolor	172	\DTLdisplayinnerlabel	148
\DTLbaroutlinewidth	173	\DTLdisplaylongdb	50
DTLbarroundvar (counter)	172	\DTLdisplaylowerbarlabel	174
\DTLbarwidth	172	\DTLdisplaylowermultibarlabel	174
\DTLbarXlabelalign	173	\DTLdisplayouterlabel	148
\DTLbarYticklabelalign	174	\dtldisplaystartrow	55
\dtlbeforecols	52	\dtldisplaystarttab	54
\dtlbeforerow	101	\DTLdisplayupperbarlabel	174
\dtlbetweencols	53	\DTLdisplayuppermultibarlabel	174
\DTLbetweeninitials	34	\dtldisplayvalign	54
\DTLBIBdbname	199	\DTLdiv	25
\DTLbibfield	194	\DTLdobarcolor	172
\DTLbibfieldcontains	186	\DTLdocurrentpiesegmentcolor	149
\DTLbibfieldexists	185	\DTLdopiesegmentcolor	149
\DTLbibfieldiseq	186	\dtlenableUTFviii	85
\DTLbibfieldisge	187	\DTLendbibitem	191
\DTLbibfieldisgt	186	\DTLendpt	173
\DTLbibfieldisle	186	DTLenvforeach (environment)	57, 57
\DTLbibfieldislt	186	DTLenvforeach* (environment)	57, 57
\DTLbibfieldlet	195	\DTLeverybarhook	173
\DTLbibitem	191	\dtlexpandnewvalue	43
\DTLbibliography	185	\DTLfetch	98
\DTLbibliographystyle	189	\DTLfetchlistelement	38
DTLbibrow (counter)	187, 196	\dtlforcolumn	107
\dtlbreak	59, 107	\dtlforcolumnidx	107
\DTLcite	197	\DTLforeach	56, 58–61, 69, 75, 78–81, 98, 106, 134, 141, 150, 153, 166, 169
\DTLcleardb	95	\DTLforeach*	56
\DTLclip	31	\DTLforeachbibentry	194, 195
\DTLcolumncount	42	\DTLforeachbibentry*	194
\dtlcolumnindex	97	\dtlforeachkey	106
\dtlcompare	38, 83, 89, 137	\DTLforeachkeyinrow	59
\DTLcomputebounds	81	\DTLformatabbrvforenames	190
\DTLcomputewidestbibentry	196	\DTLformatauthor	190
\DTLconverttodecimal	22, 77, 166		

\DTLformatbibentry	195	\DTLgidxSetCompositor	114
\DTLformateditor	190	\DTLgidxSetDefaultDB	115
\DTLformatforenames	190	\DTLgidxStripBackslash	123
\DTLformatjr	191	\DTLgidxSubCategorySep	135
\DTLformatlegend	165	\DTLgidxSubject	119
\DTLformatlist	35	\DTLgmax	28
\DTLformatsurname	190	\DTLgmaxall	28
\DTLformatvon	190	\DTLgmeanall	29
\DTLgabs	26	\DTLgmin	27
\DTLgadd	24, 78	\DTLgminall	27
\DTLgaddall	24	\DTLgmul	25
\DTLgclearadb	95	\DTLgneg	26
\DTLgclip	31	\DTLgnewdb	42
\DTLgdeletedb	95	\DTLground	30
\DTLgdiv	26	\DTLgsdforall	30
\DTLgetcolumnindex	97	\DTLgsqrt	27
\DTLgetdatatype	96	\DTLgsub	25
\dtlgetentryfromcurrentrow	102	\DTLgtrunc	30
\DTLgetkeydata	97	\DTLgvarianceforall	29
\DTLgetkeyforcolumn	97	\dtlheaderformat	53
\DTLgetlocation	97	\dtlicompare	39, 83, 89
\dtlgetrow	100	\DTLifAllLowerCase	14
\dtlgetrowforvalue	101	\DTLifAllUpperCase	14
\DTLgetrowindex	100	\DTLifbibanyfieldexists	195
\dtlgetrowindex	100	\DTLifbibfieldexists	195
\DTLgetvalue	97, 107	\DTLifcasedatatype	8
\DTLgetvalueforkey	97	\DTLifclosedbetween	12
\DTLgidxAcrStyle	130	\DTLifclosedbetween*	12
\DTLgidxAddLocationType	114	\DTLifcurrency	6
\DTLgidxCategoryNameFont	135	\DTLifcurrencyunit	7
\DTLgidxCategorySep	135	\DTLifdbempty	42
\DTLgidxChildSep	135	\DTLifdbexists	96
\DTLgidxCounter	114	\DTLlifeq	9
\DTLgidxCurrentdb	136	\DTLlifeq*	9
\DTLgidxDictPostItem	136	\DTLiffirstrow	59, 62
\DTLgidxFetchEntry	125	\DTLifFPclosedbetween	14
\DTLgidxGobble	123	\DTLifFPopenbetween	14
\DTLgidxIgnore	123	\DTLifgt	11
\DTLgidxMac	120	\DTLifgt*	12
\DTLgidxName	119	\DTLifhaskey	96
\DTLgidxNameNum	120	\DTLifinlist	37
\DTLgidxNoFormat	122	\DTLifint	5
\DTLgidxOffice	121	\DTLiflastrow	59
\DTLgidxParen	118	\DTLiflt	10
\DTLgidxParticle	121	\DTLiflt*	11
\DTLgidxPlace	119	\DTLifnull	72
\DTLgidxPostChild	135	\DTLifnulllorempty	72
\DTLgidxRank	120	\DTLifnumclosedbetween	12
\DTLgidxSaint	120	\DTLifnumeq	8

\dtlifnumeq	8	\DTLisnumerical	16
\DTLifnumerical	7	\DTLisopenbetween	19
\DTLifnumgt	11	\DTLisPrefix	21
\DTLifnumlt	10	\DTLisreal	17
\dtlifnumlt	9	\DTLisstring	16
\DTLifnumopenbetween	13	\DTLisSubString	21
\DTLifoddrow	59, 64	\dtllastloadeddb	95
\DTLifopenbetween	13	\DTLlegendxoffset	163
\DTLifopenbetween*	13	\DTLlegendyoffset	163
\DTLifreal	5	\dtlletterindexcompare	39, 83
\DTLifStartsWith	15	\DTLlistelement	37
\DTLifstring	8	\DTLlistformatitem	36
\DTLifstringclosedbetween	12	\DTLlistformatlastsep	36
\DTLifstringclosedbetween*	12	\DTLlistformatoxford	36
\DTLifstringeq	9	\DTLlistformatsep	36
\DTLifstringeq*	9	\DTLloadbbl	184
\DTLifstringgt	11	\DTLloaddb	45, 47, 48, 96, 206
\DTLifstringgt*	11	\DTLloaddb options	
\DTLifstringlt	10	autokeys	46
\DTLifstringlt*	10	headers	46, 68
\DTLifstringopenbetween	13	keys	45, 46
\DTLifstringopenbetween*	13	noheader	45
\DTLifSubString	15	noheaders	51
\DTLinitialhyphen	34	omitlines	46
\DTLinitials	33	\DTLloaddbtex	44
\dtlinsertinto	39	\DTLloadmbbl	198
\dtlintalign	52	\DTLloadrawdb	48, 96
\dtlintformat	53	\DTLmajorgridstyle	165
\DTLinttype	96	\DTLmaketabspace	46
\DTLisclosedbetween	19	\DTLmax	28
\DTLiscurrency	17	\DTLmaxall	28
\DTLiscurrencyunit	17	DTLmaxauthors (counter)	191
\DTLiseq	18	DTLmaxeditors (counter)	191
\DTLisFPclosedbetween	20	\DTLmaxforcolumn	81
\DTLisFPeq	20	\DTLmaxforkeys	81, 168
\DTLisFPgt	20	\DTLmbibitem	191
\DTLisFPgteq	20	\DTLmbibliography	198
\DTLisFPplt	19	\DTLmeanforall	29
\DTLisFPlteq	20	\DTLmeanforcolumn	79
\DTLisFPopenbetween	20	\DTLmeanforkeys	79, 81
\DTLisgt	18, 61	\DTLmidpt	173
\DTLisiclosedbetween	19	\DTLmin	27
\DTLisieq	19	\DTLminall	27
\DTLisigt	18	\DTLminforcolumn	81
\DTLisilt	18	\DTLminforkeys	80, 168
\DTLisinlist	21	\DTLminorgridstyle	165
\DTLisint	18	\DTLminorticklength	163
\DTLisioopenbetween	19	\DTLmintickgap	155, 163
\DTLislt	18	\DTLmul	25

<code>\DTLmultibarchart</code>	169	<code>\DTLpieoutlinecolor</code>	150
<code>\DTLmultibarchart options</code>		<code>\DTLpieoutlinewidth</code>	150
<code>axes</code>	170	<code>\DTLpiepercent</code>	147
<code>barlabel</code>	170	<code>DTLpieroundvar (counter)</code>	147
<code>groupgap</code>	171, 177	<code>\DTLpievariable</code>	146
<code>length</code>	170	<code>\DTLplot</code>	153, 162–164, 167, 168
<code>max</code>	170, 177	<code>\DTLplot options</code>	
<code>maxdepth</code>	170, 177	<code>axes</code>	154
<code>multibarlabels</code>	170	<code>bounds</code>	153, 155
<code>uppermultibarlabels</code>	170	<code>box</code>	154
<code>variables</code>	170, 177	<code>colors</code>	153
<code>verticalbars</code>	171	<code>grid</code>	155
<code>ylabel</code>	171	<code>height</code>	154
<code>yticgap</code>	170	<code>legend</code>	156, 159
<code>yticlabels</code>	170	<code>legendlabels</code>	156
<code>yticpoints</code>	170	<code>linecolors</code>	153
<code>\DTLmultibibs</code>	197	<code>lines</code>	154
<code>\DTLneg</code>	26	<code>markcolors</code>	153
<code>\DTLnegextent</code>	177	<code>marks</code>	153
<code>\DTLnewcurrencysymbol</code>	4, 7	<code>maxx</code>	155
<code>\DTLnewdb</code>	42, 94, 199	<code>maxy</code>	155
<code>\DTLnewdbentry</code>	43, 45, 94	<code>minx</code>	155
<code>\DTLnewdbonloadfalse</code>	48, 96	<code>miny</code>	155
<code>\DTLnewdbonloadtrue</code>	48	<code>style</code>	154, 156
<code>\DTLnewrow</code>	42, 94	<code>ticdir</code>	155
<code>\DTLnocite</code>	197	<code>width</code>	154
<code>\dtlnoexpandnewvalue</code>	43	<code>x</code>	153
<code>\DTLnumbernull</code>	72	<code>xlabel</code>	155
<code>\DTLnumitemsinlist</code>	37	<code>xminoritics</code>	154
<code>\DTLpar</code>	43, 49	<code>xticdir</code>	154
<code>\DTLpieatbegintikz</code>	151	<code>xticgap</code>	155
<code>\DTLpieatendtikz</code>	151	<code>xticlabels</code>	155
<code>\DTLpiechart</code>	141, 151	<code>xticpoints</code>	155, 159
<code>\DTLpiechart options</code>		<code>xtics</code>	154
<code>cutaway</code>	142, 144	<code>y</code>	153
<code>cutawayoffset</code>	142	<code>ylabel</code>	155
<code>cutawayratio</code>	142	<code>yminoritics</code>	154
<code>innerlabel</code>	142, 147	<code>yticdir</code>	154
<code>inneroffset</code>	142	<code>yticgap</code>	155
<code>innerratio</code>	141, 142	<code>yticlabels</code>	155
<code>outerlabel</code>	142, 143, 151	<code>yticpoints</code>	155
<code>outeroffset</code>	142	<code>ytics</code>	154
<code>outerratio</code>	142	<code>\DTLplotatbegintikz</code>	161, 168
<code>radius</code>	141, 142	<code>\DTLplotatendtikz</code>	161, 168
<code>ratio</code>	142	<code>\dtlplothandlermark</code>	161, 168
<code>rotateinner</code>	142	<code>\DTLplotheight</code>	163
<code>rotateouter</code>	142	<code>\DTLplotlinecolors</code>	164
<code>start</code>	141	<code>\DTLplotlines</code>	164
<code>variable</code>	141, 142, 147	<code>\DTLplotmarkcolors</code>	164

F	
<code>\femalelabels</code>	200, 206
<code>\femalename</code>	209, 209
<code>\field</code>	128
file types	
<code>aux</code>	181
<code>bbl</code>	181, 182, 184, 185, 188
<code>bib</code>	181, 182, 184, 193, 194
<code>bst</code>	181
<code>\foreachperson</code>	209
fp package	ii, 2, 22, 23, 77
G	
<code>\gdef</code>	122
<code>\gDTLforeachbibentry</code>	194
<code>\gDTLforeachbibentry*</code>	194
<code>\gDTLformatbibentry</code>	195
<code>\getpersonfullname</code>	209
<code>\getpersongender</code>	209
<code>\getpersonname</code>	209
glossaries package ..	3, 112, 113, 126, 127, 131
<code>\Gls</code>	127
<code>\gls</code>	127
<code>\glsadd</code>	126
<code>\glsaddall</code>	126
<code>\Glsdispentry</code>	125
<code>\glsdispentry</code>	125
<code>\glslink</code>	125
<code>\Glsnl</code>	127
<code>\glsnl</code>	127
<code>\Glspl</code>	127
<code>\glspl</code>	127
<code>\Glsplnl</code>	127
<code>\glsplnl</code>	127
<code>\glsreset</code>	131
<code>\glsresetall</code>	131
<code>\Glsym</code>	128
<code>\glsym</code>	128
<code>\glsunset</code>	131
<code>\glsunsetall</code>	131
graphics package	176
graphicx package	176
H	
<code>\hfill</code>	132
hyperref package	124, 138
I	
<code>\ifallfemale</code>	208
<code>\ifallmale</code>	208
<code>\ifdefempty</code>	71
<code>\ifDTLlistskipempty</code>	35
<code>\ifDTLverticalbars</code>	173
<code>\ifentryused</code>	132
<code>\iffemale</code>	208
<code>\iffemalelabel</code>	208
<code>\ifmale</code>	207
<code>\ifmalelabel</code>	208
<code>\ifpersonexists</code>	207
<code>\iftermexists</code>	132
ifthen package	16, 56, 187
<code>\input</code>	44, 95
inputenc package	2, 85, 117, 137
L	
label options	
<code>o</code>	116
<code>\let</code>	122
<code>\loadgidx</code>	112
loadgidx options	
<code>sort</code>	112
<code>longtable (environment)</code>	50, 54
longtable package	50
<code>\loop</code>	107
M	
<code>\makefirstuc</code>	2, 133
<code>makeindex</code>	112, 114, 136, 137
<code>\MakeLowercase</code>	116
<code>\MakeTextLowercase</code>	116
<code>\MakeTextUppercase</code>	116, 129, 130
<code>\MakeUppercase</code>	116
<code>\malelabels</code>	200, 206
<code>\malename</code>	209, 209
mfirstuc package	2, 124, 130, 133, 137
<code>\midrule</code>	55, 62, 63
multicol package	133
<code>multicols (environment)</code>	133
<code>multicols* (environment)</code>	113
N	
<code>\newacro</code>	129
<code>\newgidx</code>	113, 131, 132, 134
newgidx options	
<code>balance</code>	113
<code>heading</code>	113
<code>postheading</code>	113
<code>showgroups</code>	113
<code>sort</code>	113
<code>style</code>	113, 134

<code>\newperson</code>	200, 206	<code>postname</code>	138
<code>\newterm</code>	115, 125, 128, 129	<code>prelocation</code>	138
<code>\newterm options</code>		<code>rotateinner</code>	141, 142
<code>database</code>	115	<code>rotateouter</code>	141, 142
<code>description</code>	116, 125	<code>see</code>	138
<code>label</code>	116	<code>separator</code>	2
<code>long</code>	116, 126, 129	<code>style</code>	188, 189
<code>longplural</code>	116, 126	<code>symboldesc</code>	138
<code>parent</code>	116, 126	<code>utf8</code>	2, 85, 137
<code>plural</code>	116, 125	<code>verbose</code>	2, 3, 138, 181
<code>see</code>	116, 126	<code>true</code>	2, 3
<code>seealso</code>	116, 126	<code>vertical</code>	169, 173
<code>short</code>	116, 126, 129	<code>\Peoplechild</code>	205
<code>shortplural</code>	116, 126	<code>\peoplechild</code>	205
<code>sort</code>	116, 126	<code>\peoplefullname</code>	204
<code>symbol</code>	116, 125	<code>\peoplename</code>	204
<code>text</code>	116, 125, 129–131	<code>\Peopleobjpronoun</code>	204
<code>\newtermaddfield</code>	128	<code>\peopleobjpronoun</code>	204
<code>\newtermlabelhook</code>	122	<code>\Peopleparent</code>	205
<code>\not</code>	187	<code>\peopleparent</code>	205
		<code>\Peoplepossadj</code>	204
	O	<code>\peoplepossadj</code>	204
<code>\oe</code>	117	<code>\Peopleposspronoun</code>	205
		<code>\peopleposspronoun</code>	204
	P	<code>\Peoplepronoun</code>	204
<code>package options:</code>		<code>\peoplepronoun</code>	204
<code>child</code>	138	<code>\Peoplesibling</code>	205
<code>color</code>	141, 169	<code>\peoplesibling</code>	205
<code>columns</code>	138	person package	ii, 2, 3, 200, 206, 207, 209
<code>compositor</code>	115, 138	<code>\Personchild</code>	203
<code>delimiter</code>	2	<code>\personchild</code>	202
<code>draft</code>	138	<code>\personfullname</code>	201
<code>final</code>	138	<code>\personname</code>	202
<code>gray</code>	141, 169	<code>\Personobjpronoun</code>	203
<code>horizontal</code>	169, 174	<code>\personobjpronoun</code>	202
<code>location</code>	138	<code>\Personparent</code>	203
<code>math</code>	2, 3	<code>\personparent</code>	202
<code>fp</code>	2, 3	<code>\Personpossadj</code>	203
<code>pgfmath</code>	2, 3	<code>\personpossadj</code>	202
<code>namecase</code>	138	<code>\Personposspronoun</code>	203
<code>namefont</code>	138	<code>\personposspronoun</code>	202
<code>norotateinner</code>	141, 142	<code>\Personpronoun</code>	202
<code>norotateouter</code>	141, 142	<code>\personpronoun</code>	202
<code>nowarn</code>	138	<code>\Personsibling</code>	203
<code>optimize</code>	137, 138	<code>\personsibling</code>	202
<code>high</code>	137	pgf package	
<code>low</code>	137	. 3, 23, 141, 153, 154, 164, 166, 169, 180	
<code>off</code>	137	pgfmath package	ii, 2, 22, 23
<code>postdesc</code>	138	<code>\pgfplotshandlermark</code>	161, 168

