

The Title

Author Name

Author Two

Author Three

Institution

ABSTRACT

You can add an abstract like this! Dont forget to close the abstract commands with AE (abstract end). most of the tags are mnemonic so it should be easy to remember.

1. The First Section Using a Numbered Heading

This is an indented paragraph. Even Though it's only two sentences.

Here is another indented paragraph with some dummy text so you can see what it looks like. Sed et laboriosam officiis. Excepturi vero iusto quos. Laboriosam adipisci quia similique nesciunt quas aperiam corrupti vel. Explicabo possimus quaerat fugiat eius tempora inventore commodi debitis. Porro est dolores sequi.

Here is an un-indented paragraph with some dummy text so you can see what it looks like. Sed et laboriosam officiis. Excepturi vero iusto quos. Laboriosam adipisci quia similique nesciunt quas aperiam corrupti vel. Explicabo possimus quaerat fugiat eius tempora inventore commodi debitis. Porro est dolores sequi.

Here is a blockquote, it is essentially a paragraph that has been indented on both sides.

2. Equations

We can also type equations using EQN which is very simple and most of the syntax follows as you would say them. When in doubt use curly braces to isolate terms before dealing with them further¹. Below are some examples

The phrase `x = 1 over 2` generates

$$x = \frac{1}{2}$$

The phrase `y = 2 x sup 2 + 4x - 2` generates the following

$$y = 2x^2 + 4x - 2$$

The phrase `y=4sin(x)-cos sup 2 (x)` generates the following

$$y = 4\sin(x) - \cos^2(x)$$

Heres an example of a more complex equation where you might need to use curly braces. The phrase

`s = sqrt { { sum from i=1 to inf (x sub i - x bar) sup 2 } over { N - 1 } }`
generates the following

$$s = \sqrt{\frac{\sum_{i=1}^{\infty} (x_i - \bar{x})^2}{N - 1}}$$

3. Images

The problem with images is that they need to be encapsulated postscript or .eps files. Your images can be converted to eps using the `convert` command, found in ImageMagick.

```
$ convert test.jpg test.eps
```

After converting your images to eps files they can be included like below.



Figure 1: A rare pepe.

3.1. notes on adding tables, equations and figures

If you add any of these you need to use the appropriate command line arguments at compile time to pass the images, equations, or tables to their respective preprocessor. An example of a compile command might be

```
groff -ms -e -t -p file.ms -Tpdf > file.pdf
```

Where `-e` passes equations to EQN, `-p` passes figures and images to PIC, `-t` passes tabel to TBL.

4. Some more stuff about headings

5. This is a level one heading

Sed et laboriosam officiis. Excepturi vero iusto quos. Laboriosam adipisci quia similique nesciunt quas aperiam corrupti vel. Explicabo possimus quaerat fugiat eius tempora inventore commodi debitis. Porro est dolores sequi.

5.1. This is a level two heading

Sed et laboriosam officiis. Excepturi vero iusto quos. Laboriosam adipisci quia similique nesciunt quas aperiam corrupti vel. Explicabo possimus quaerat fugiat eius tempora inventore commodi debitis. Porro est dolores sequi.

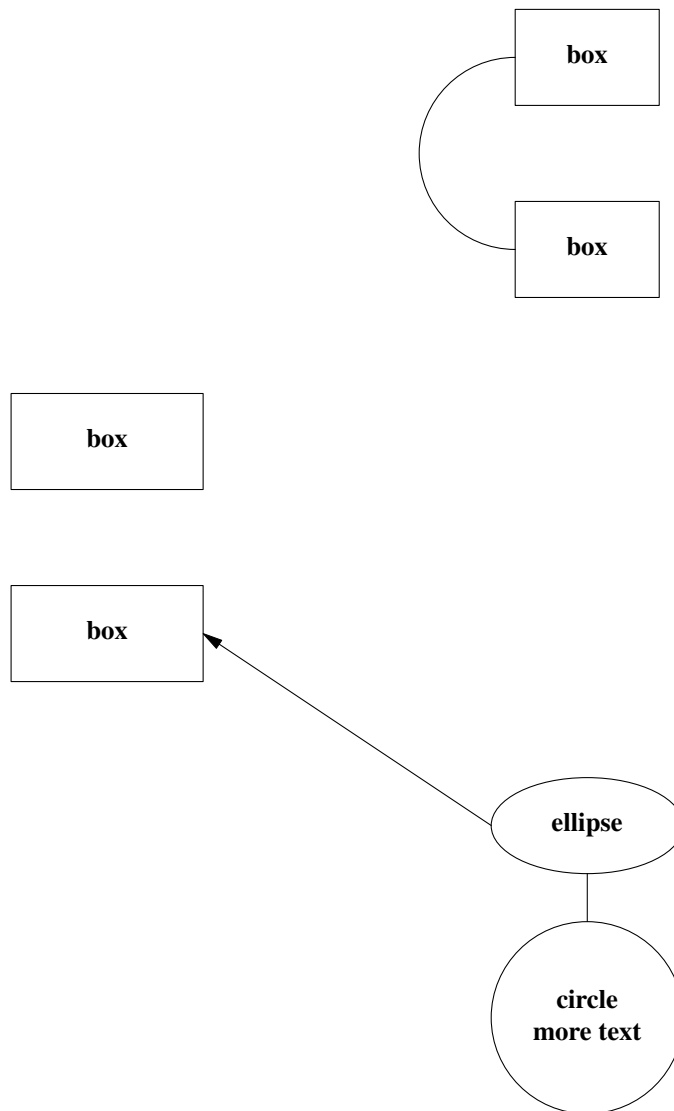
5.1.1. This is a level three heading

Sed et laboriosam officiis. Excepturi vero iusto quos. Laboriosam adipisci quia similique nesciunt quas aperiam corrupti vel. Explicabo possimus quaerat fugiat eius tempora inventore commodi debitis. Porro est dolores sequi.

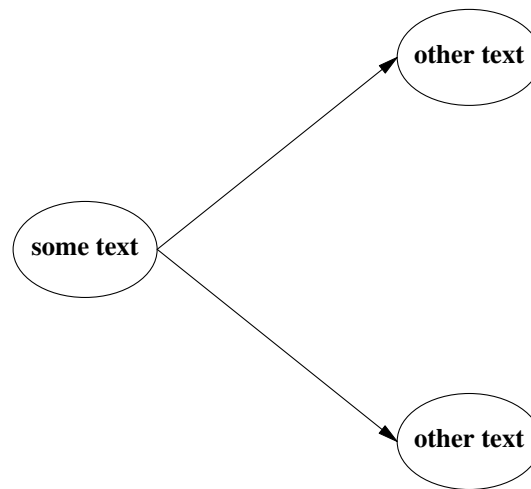
5.1.1.1. This is a level four heading

Sed et laboriosam officiis. Excepturi vero iusto quos. Laboriosam adipisci quia similique nesciunt quas aperiam corrupti vel. Explicabo possimus quaerat fugiat eius tempora inventore commodi debitis. Porro est dolores sequi.

6. Drawing stuff with PIC



6.1. A more useful example



7. Lists

heres a paragraph with no indent followed by a bulleted list

- item one
- item two
- item three
- item four

Numbered lists are a bit tougher since you have to manually add the numbers

- 1 item one
- 2 item two
- 3 item three

you can use a macro to create auto numbering lists These macros look like so:

```
.de NL
.IP 1
.nr list_index +1
..
```

and are called in groff like so

```
.nr list_index 1
.NL
item one
.NL
item two
.NL
item three
```

The output will look like so

```
1  item one
2  item two
3  item three
```

Note this macro implementation requires that you declare `list_index` before starting a new list otherwise the numbers will carry on from the previous list.

8. Compilation

The command I have been using to compile and generate a pdf including images, PIC graphics, equations, references and tables is:

```
$ refer file.ms | groff -ms -e -p -t -Tps > file.ps; ps2pdf file.ps file.pdf
```

this runs `refer` on the document and pipes the result into `groff`. `Groff` is then run with the `ms` macros and told to preprocess using `EQN`, `PIC`, and `TBL` and output to postscript. The resulting postscript file is then converted to pdf using the `ps2pdf` command.

You could also add a command to remove the leftover postscript file if you do not need it. The contents of a `compile.sh` script might for example be

```
#!/bin/sh
refer file.ms | groff -ms -e -p -t -Tps > file.ps;
ps2pdf file.ps file.pdf;
rm file.ps
```

The macros I use are sourced at the beginning of the `groff` document and the `refer` option are also set in the document itself. This makes the `compile` command a little bit shorter and allows me to keep different bib and macro files per document (although i usually keep one large one and use the same one every time, I am still in the process of converting my LaTeX bib into `refer`.)

9. References and Documentation

You can view the `groff_ms` documentation by running

```
$ man groff_ms
```

You can view the `EQN` documentation by running

```
$ man eqn
```

You can view the `PIC` documentation by running

```
$ man eqn
```

If you would like to look at the original troff documentation you can have a look at the following link.

```
https://troff.org/papers.html
```

References

Brian Kernighan and Lorinda Cherry, *Typesetting Mathematics, User's Guide (Second Edition)*. (1978).

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