LaTeX

CS Grad Refresher Course
September 22, 2009

by Nimalan Mahendran

Acknowledgements

Mostly cannibalized from http://tobi.oetiker.ch/lshort/lshort.pdf

The Not So Short Introduction to $\LaTeX\,2_\varepsilon$

Or $\LaTeX\,2_\varepsilon$ in 138 minutes

with a few nibbles from http://nitens.org/taraborelli/latex

Why use LaTeX?

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Focus on content, rather than layout

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Typeset complex mathematical formulae

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Manage changes to documents using source code management tools like Subversion or git

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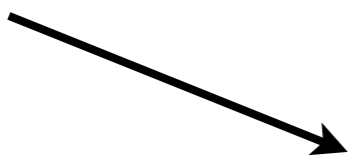Avoid being made fun of by 1337 computer scientists
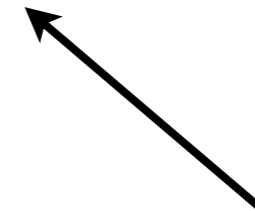
Why use LaTeX?

Word ⟶ Table

Table ⟵ LaTeX

Why use LATEX?

Word

fire flower fjörd

fire flower fjörd

LATEX

When using LaTeX,

When using LaTeX,

When using LaTeX,

 is your

A minimal LaTeX file

```
\documentclass{article}
\begin{document}
Small is beautiful.
\end{document}
```

A minimal LaTeX file

or book or report or letter...

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The LaTeX file is in plaintext.

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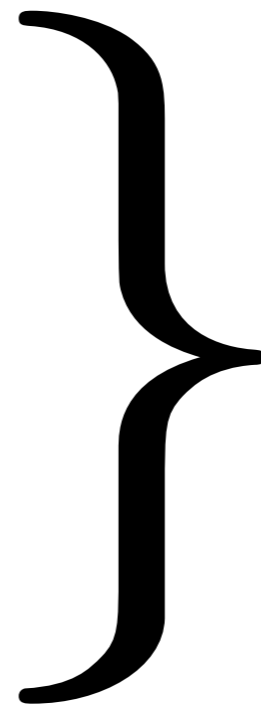Compile it with `latex foo.tex`

or `pdflatex foo.tex`

A LaTeX command

\command[optnl-arg1]..[optnl-argn]{reqd-arg1}..{reqd-argn}

A less minimal LaTeX file

```
\documentclass[a4paper,11pt]{article}
% define the title
\author{H.~Partl}
\title{Minimalism}
\begin{document}
% generates the title
\maketitle
% insert the table of contents
\tableofcontents
\section{Some Interesting Words}
Well, and here begins my lovely article.
\section{Good Bye World}
\ldots{} and here it ends.
\end{document}
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preamble

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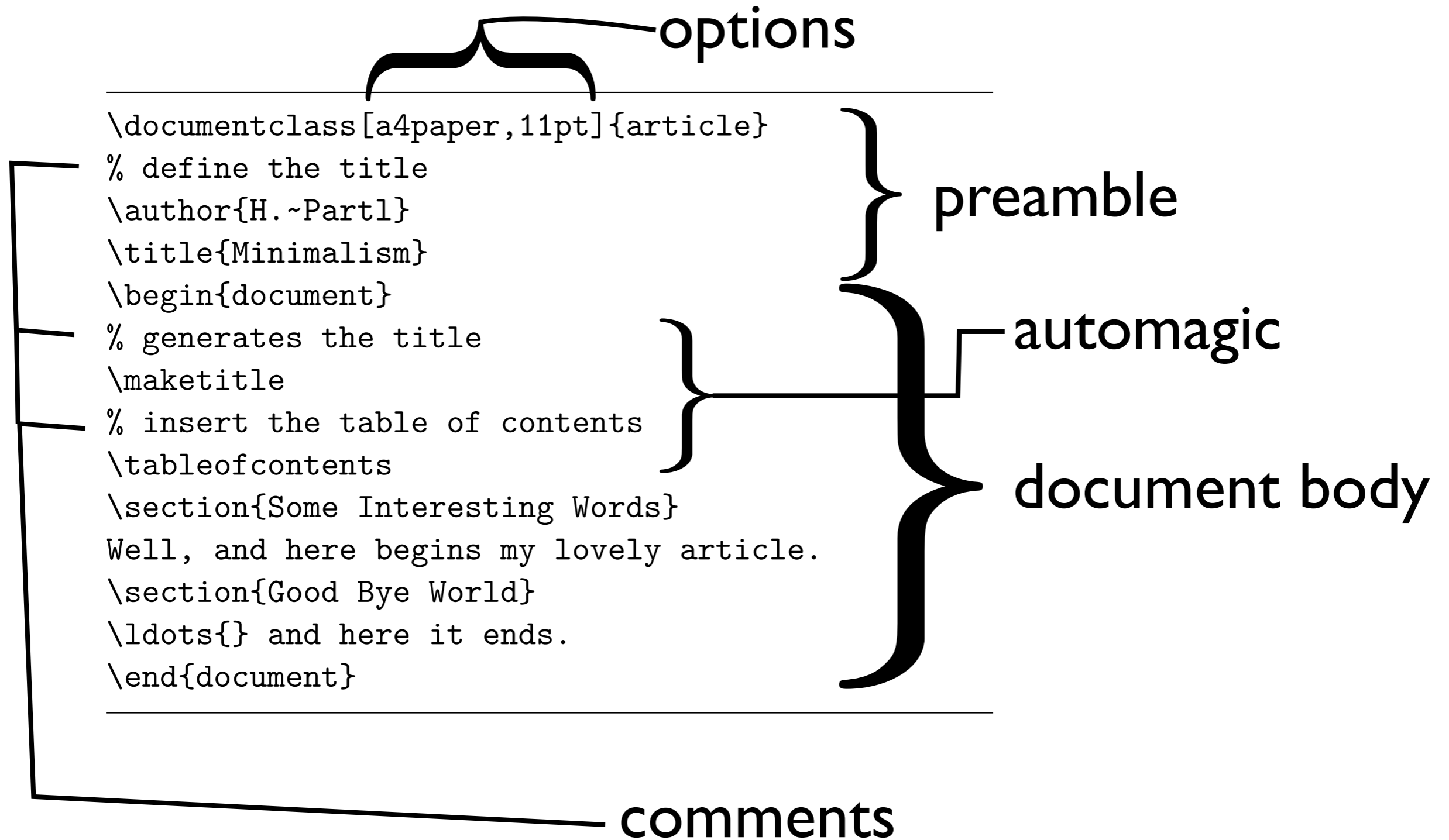
preamble

automagic

document body

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\end{document}
```

preamble

automagic

document body

comments

Document structure

```
\chapter{Flux Capacitors}
\section{Power Sources}
\subsection{Lightning Strikes}
\subsubsection{Lightning Strike Harnessing Methods}
\paragraph{Clock Tower}
\subparagraph{Unforeseen Hazards: School Dances}
```

Chapter 1

Flux Capacitors

1.1 Power Sources

1.1.1 Lightning Strikes

Lightning Strike Harnessing Methods

Clock Tower

Unforeseen Hazards: School Dances

Document structure

Only report and book

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Chapter 1

Flux Capacitors

1.1 Power Sources

1.1.1 Lightning Strikes

Lightning Strike Harnessing Methods

Clock Tower

Unforeseen Hazards: School Dances

Cross references

$\boxed{\texttt{\textbackslash label\{}\textit{marker}\texttt{\}}, \texttt{\textbackslash ref\{}\textit{marker}\texttt{\}} \text{ and } \texttt{\textbackslash pageref\{}\textit{marker}\texttt{\}}}$

```
A reference to this subsection
\label{sec:this} looks like:
``see section~\ref{sec:this} on
page~\pageref{sec:this}.''
```

A reference to this subsection looks like: "see section 2.8 on page 37."

Footnotes

$$\backslash\texttt{footnote}\{\textit{footnote text}\}$$

```
Footnotes\footnote{This is
  a footnote.} are often used
by people using \LaTeX.
```

Footnotes[a] are often used by people using LATEX.
_____
[a]This is a footnote.

Citations

```
@book{say-things,
abstract = {This is all about how to say things effectively},
author = {Sayer J. and Teller W.},
howpublished = {Hardcover},
isbn = {0387987932},
keywords = {speech},
month = {August},
publisher = {Springer},
title = {How to say stuff},
year = {1999}
}
@inproceedings{say-other-things,
address = {Arlington, Virginia, United States},
author = {Speaker M. and Whisperer H. and Shouter F.},
booktitle = {ESS '04: Proceedings of the 20th conference on
                Experimentally Saying Stuff},
pages = {243--250},
publisher = {ESS Press},
title = {If you have nothing nice to say, good for you},
url = {http://portal.acm.org/citation.cfm?id=1036843.1036873},
year = {2004}
}
```

Citations

```
I am going to say this and cite it \cite{say-things}, right before I
say this other thing and cite this other thing
\cite{say-other-things}.

\bibliography{examples}{}
\bibliographystyle{alpha}
```

I am going to say this and cite it [JW99], right before I say this other thing and cite this other thing [MHF04].

References

[JW99]   Sayer J. and Teller W. *How to say stuff*. Springer, August 1999.

[MHF04] Speaker M., Whisperer H., and Shouter F. If you have nothing nice to say, good for you. In *ESS '04: Proceedings of the 20th conference on Experimentally Saying Stuff*, pages 243–250, Arlington, Virginia, United States, 2004. ESS Press.

Tables

```
\begin{tabular}{|r|l|}
\hline
7C0 & hexadecimal \\
3700 & octal \\ \cline{2-2}
11111000000 & binary \\
\hline \hline
1984 & decimal \\
\hline
\end{tabular}
```

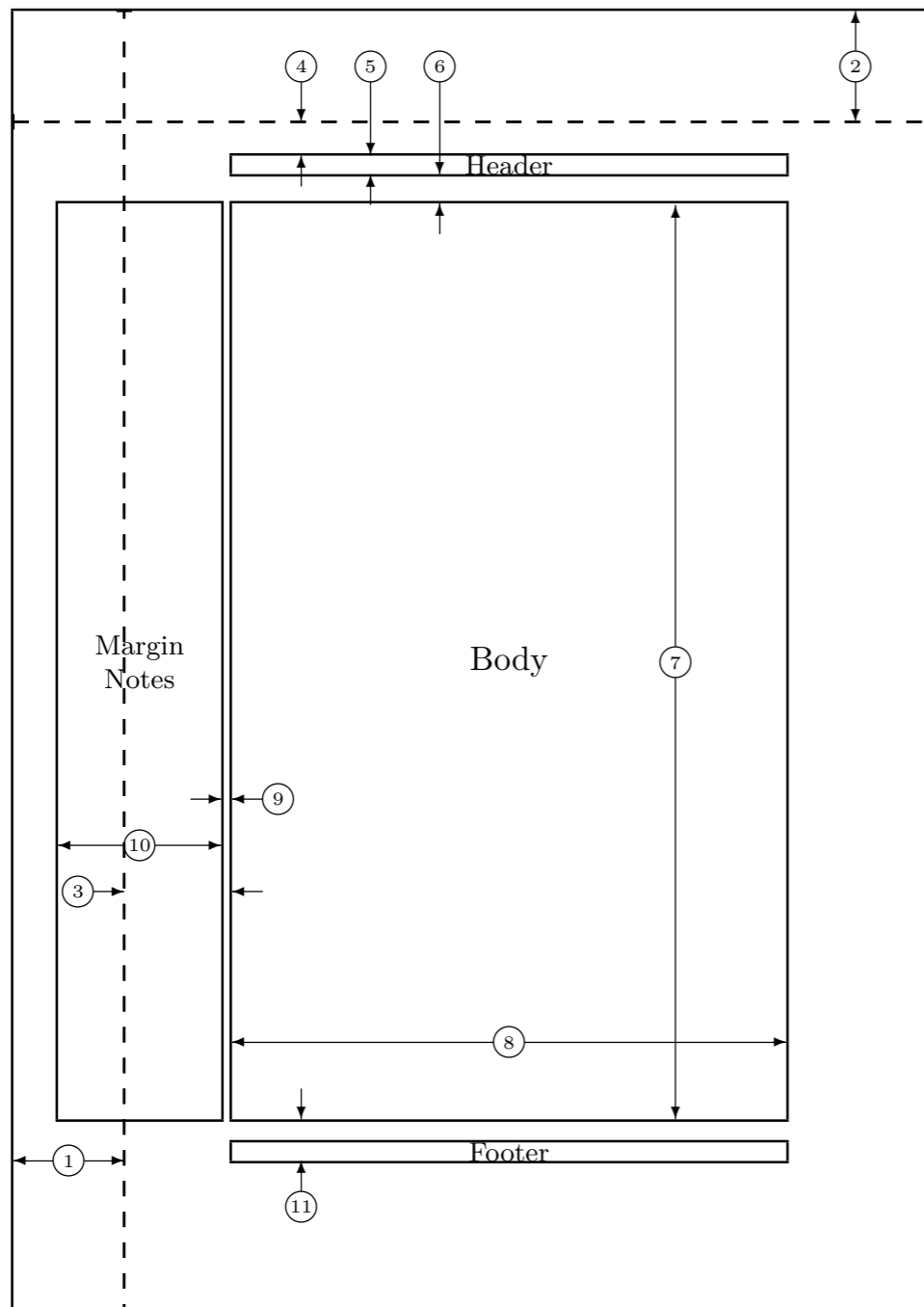| 7C0	hexadecimal
3700	octal
11111000000	binary
1984	decimal

Figures

```
\begin{figure}[h]
  \caption{Discipline is key in an effective military.}
\centering
\includegraphics[width=0.4\textwidth]{discipline.jpg}
\end{figure}
```

Figure 1: Discipline is key in an effective military.

Lengths and layout

1	one inch + \hoffset	2	one inch + \voffset
3	\oddsidemargin = 22pt or \evensidemargin	4	\topmargin = 22pt
5	\headheight = 12pt	6	\headsep = 19pt
7	\textheight = 595pt	8	\textwidth = 360pt
9	\marginparsep = 7pt	10	\marginparwidth = 106pt
11	\footskip = 27pt		\marginparpush = 5pt (not shown)
	\hoffset = 0pt		\voffset = 0pt
	\paperwidth = 597pt		\paperheight = 845pt

Modifying lengths

$\setlength\{\textit\{parameter}\}\{\textit\{length}\}$

$\addtolength\{\textit\{parameter}\}\{\textit\{length}\}$

\addtolength{\textwidth}{1in}
\addtolength{\textheight}{2.25in}

Nudging and spacing

This\hspace{1.5cm}is a space of 1.5 cm.

This   is a space of 1.5 cm.

\vspace{*length*}

Line breaks

`\\ or \newline`

`\\*`

$\mbox\{text\}$

`\newpage`

Text Justification

```
\begin{flushleft}
This text is\\ left-aligned.
\LaTeX{} is not trying to make
each line the same length.
\end{flushleft}
```

This text is
left-aligned. LATEX is not trying to make
each line the same length.

```
\begin{flushright}
This text is right-\\aligned.
\LaTeX{} is not trying to make
each line the same length.
\end{flushright}
```

This text is right-
aligned. LATEX is not trying to make each
line the same length.

```
\begin{center}
At the centre\\of the earth
\end{center}
```

At the centre
of the earth

Lists

```
\flushleft
\begin{enumerate}
\item You can mix the list
environments to your taste:
\begin{itemize}
\item But it might start to
look silly.
\item[-] With a dash.
\end{itemize}
\item Therefore remember:
\begin{description}
\item[Stupid] things will not
become smart because they are
in a list.
\item[Smart] things, though,
can be presented beautifully
in a list.
\end{description}
\end{enumerate}
```

1. You can mix the list environments to your taste:

   - But it might start to look silly.
   - With a dash.

2. Therefore remember:

   Stupid things will not become smart because they are in a list.

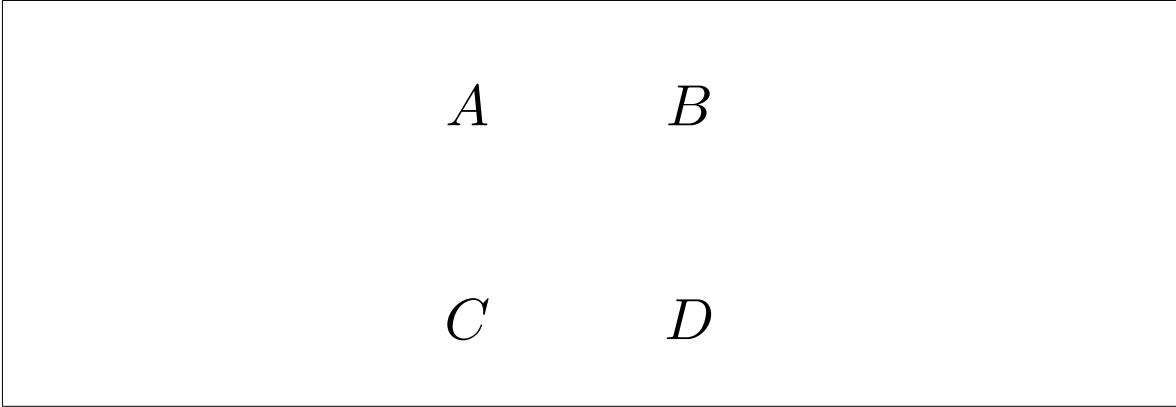   **Smart** things, though, can be presented beautifully in a list.

Algorithms

```
\begin{algorithm}
\caption{A new method for solving the Halting Problem}
\begin{algorithmic}
\STATE $x = 0$
\WHILE{$x < 10$}
\STATE $x = (x + 1)^k$
\ENDWHILE
\RETURN $x^k$
\end{algorithmic}
\end{algorithm}
```

Algorithm 1 A new method for solving the Halting Problem

$x = 0$

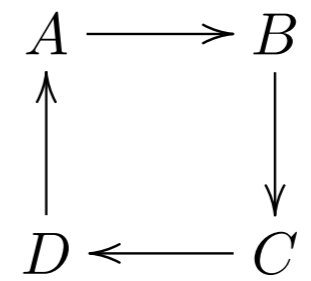**while** $x < 10$ **do**

$x = (x + 1)^k$

end while

return x^k

XY-Pic

```
\begin{displaymath}
\xymatrix{A & B \\
          C & D }
\end{displaymath}
```
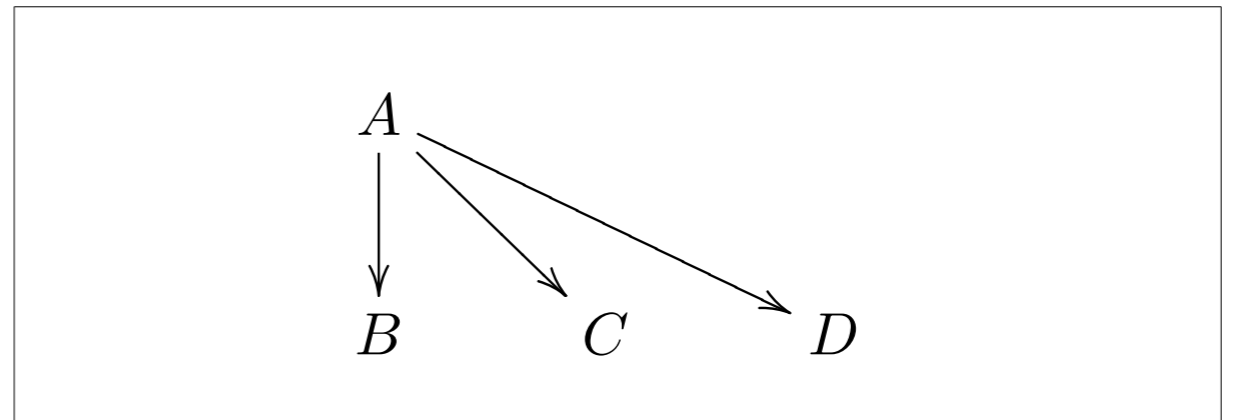
$$
\begin{matrix}
A & B \\
C & D
\end{matrix}
$$

XY-Pic

```
\begin{displaymath}
\xymatrix{ A \ar[r] & B \ar[d] \\
           D \ar[u] & C \ar[l] }
\end{displaymath}
```

$$
\begin{array}{ccc}
A & \longrightarrow & B \\
\uparrow & & \downarrow \\
D & \longleftarrow & C
\end{array}
$$

XY-Pic

```
\begin{displaymath}
\xymatrix{
  A \ar[d] \ar[dr] \ar[drr] & & \\
  B                         & C & D }
\end{displaymath}
```

XY-Pic

```
\begin{displaymath}
\xymatrix{
  A \ar[r]^f \ar[d]_g &
                B \ar[d]^{g'} \\
  D \ar[r]_{f'}       & C }
\end{displaymath}
```

$$\xymatrix{
A \ar[r]^f \ar[d]_g & B \ar[d]^{g'} \\
D \ar[r]_{f'} & C
}$$

Equations

Add a squared and b squared
to get c squared. Or, using
a more mathematical approach:
$c^{2}=a^{2}+b^{2}$

Add a squared and b squared to get c squared. Or, using a more mathematical approach: $c^2 = a^2 + b^2$

Numbered equations

```
\begin{align}
2 + 2 & = 5 \\
\int_0^x f(y) dy & = \sin x \\
\tan \rho & = \frac{\sin \rho}{\cos \rho}
\end{align}
```

$$2 + 2 = 5 \tag{1}$$

$$\int_0^x f(y)dy = \sin x \tag{2}$$

$$\tan \rho = \frac{\sin \rho}{\cos \rho} \tag{3}$$

A more complicated equation

```
\begin{align*}
\underbrace
{
  \binom{\frac{\binom{n}{m}}{j}}{k}
  \lim_{x \rightarrow 0}
  \int_0^{\frac{\pi}{2}}
  \frac
    {\sin x^{e^{x^{e^{x^{e}}}}}}
    {\sqrt[13]{x}}
  dx
}
_{26}
\end{align*}
```

$$\underbrace{\binom{\frac{\binom{n}{m}}{j}}{k} \lim_{x \to 0} \int_0^{\frac{\pi}{2}} \frac{\sin x^{e^{x^{e^{x^{e}}}}}}{\sqrt[13]{x}} dx}_{26}$$

Vertically-aligned equations

```
\begin{align*}
\theta =
\left\{
\begin{array}{ll}
  \lambda & \textrm{if sleepy} \\
  \phi^x & \textrm{if $\sigma \geq 4$} \\
  \frac{\epsilon}{\rho} & \textrm{if $\mu = \sqrt{i}$}
\end{array}
\right.
\end{align*}
```

$$\theta = \left\{ \begin{array}{ll} \lambda & \textrm{if sleepy} \\ \phi^x & \textrm{if } \sigma \geq 4 \\ \frac{\epsilon}{\rho} & \textrm{if } \mu = \sqrt{i} \end{array} \right.$$

Looks non-trivial in Greek, with an accent

$\hat{a}$	`\hat{a}`	$\check{a}$	`\check{a}`	$\tilde{a}$	`\tilde{a}`
$\grave{a}$	`\grave{a}`	$\dot{a}$	`\dot{a}`	$\ddot{a}$	`\ddot{a}`
$\bar{a}$	`\bar{a}`	$\vec{a}$	`\vec{a}`	$\widehat{A}$	`\widehat{A}`
$\acute{a}$	`\acute{a}`	$\breve{a}$	`\breve{a}`	$\widetilde{A}$	`\widetilde{A}`
$\mathring{a}$	`\mathring{a}`				

α	`\alpha`	θ	`\theta`	o	`o`	υ	`\upsilon`
β	`\beta`	ϑ	`\vartheta`	π	`\pi`	ϕ	`\phi`
γ	`\gamma`	ι	`\iota`	ϖ	`\varpi`	φ	`\varphi`
δ	`\delta`	κ	`\kappa`	ρ	`\rho`	χ	`\chi`
ϵ	`\epsilon`	λ	`\lambda`	ϱ	`\varrho`	ψ	`\psi`
ε	`\varepsilon`	μ	`\mu`	σ	`\sigma`	ω	`\omega`
ζ	`\zeta`	ν	`\nu`	ς	`\varsigma`		
η	`\eta`	ξ	`\xi`	τ	`\tau`		
Γ	`\Gamma`	Λ	`\Lambda`	Σ	`\Sigma`	Ψ	`\Psi`
Δ	`\Delta`	Ξ	`\Xi`	Υ	`\Upsilon`	Ω	`\Omega`
Θ	`\Theta`	Π	`\Pi`	Φ	`\Phi`		

Fancy math alphabets

Example	Command	Required package
ABCDEabcde1234	\mathrm{ABCDE abcde 1234}	
ABCDEabcde1234	\mathit{ABCDE abcde 1234}	
*ABCDEabcde*1234	\mathnormal{ABCDE abcde 1234}	
𝒜ℬ𝒞𝒟ℰ	\mathcal{ABCDE abcde 1234}	
𝒜ℬ𝒞𝒟ℰ	\mathscr{ABCDE abcde 1234}	mathrsfs
𝔄𝔅ℭ𝔇𝔈abcde1234	\mathfrak{ABCDE abcde 1234}	amsfonts or amssymb
𝔸𝔹ℂ𝔻𝔼	\mathbb{ABCDE abcde 1234}	amsfonts or amssymb

Some other useful commands

`\usepackage[`*options*`]{`*package*`}`

`\pagestyle{`*style*`}`

`\thispagestyle{`*style*`}`

``Please press the `x' key.''

`\include{`*filename*`}`

`\input{`*filename*`}`

Too many LaTeX packages!

http://www.ctan.org/tex-archive/help/Catalogue/bytopic.html

http://en.wikibooks.org/wiki/LaTeX/Packages/Installing_Extra_Packages

Installing a LaTeX package

VLADIMIR: Whare are all these corpses from?
ESTRAGON: These skeletons.

. . .

VLADIMIR: A charnel-house! A charnel-house!

(*Waiting for Godot* , 41 (Beckett 1954))

[*Estragon has exited offstage to right and left and come panting back and fallen into Vladimirs arms. —Ed.*]

ESTRAGON: Im in hell!
VLADIMIR: Where were you?
ESTRAGON: Theyre coming there too!
VLADIMIR: Were surrounded! [ESTRAGON *makes a rush towards back.*] Imbecile! Theres no way out there. [HE *takes* ESTRAGON *by the arms and drags him towards front. Gesture towards front.*] There! Not a soul in sight! Off you go! Quick! [HE *pushes* ESTRAGON *towards auditorium.* ESTRAGON *recoils in horror.*] You wont? [HE *contemplates auditorium.*] Well I can understand that. Wait till I see. [HE *reflects.*] Your only hope left is to disappear. (47)

Presentations

Use the Beamer document class

Use LaTeXiT and LaTeX with Keynote (OS X)

The End

Thank you