# LaTeX primer for Scientists

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# LaTeX primers -Outline

- Getting Started
- Overleaf
- Handling errors
- Typesetting Math
- Figure environment
- Tables
- Bibliography

# Some intro

- LaTeX (Lah-tek) is a typesetting system which relies on command lines describing the meaning and structure of the text.
- The system processes both your text and the formatting command to produce a formatted document.
- Formatting involves mathematical equations, tables, figures, and bibliography.
- The community of users is so big that there is a solution for almost any issue.

https://www.latex-project.org/help/documentation/usrguide.pdf

https://en.wikibooks.org/wiki/LaTeX/Basics

https://tex.stackexchange.com/ ← Forum for asking questions

# Getting started

Preamble, also known as class

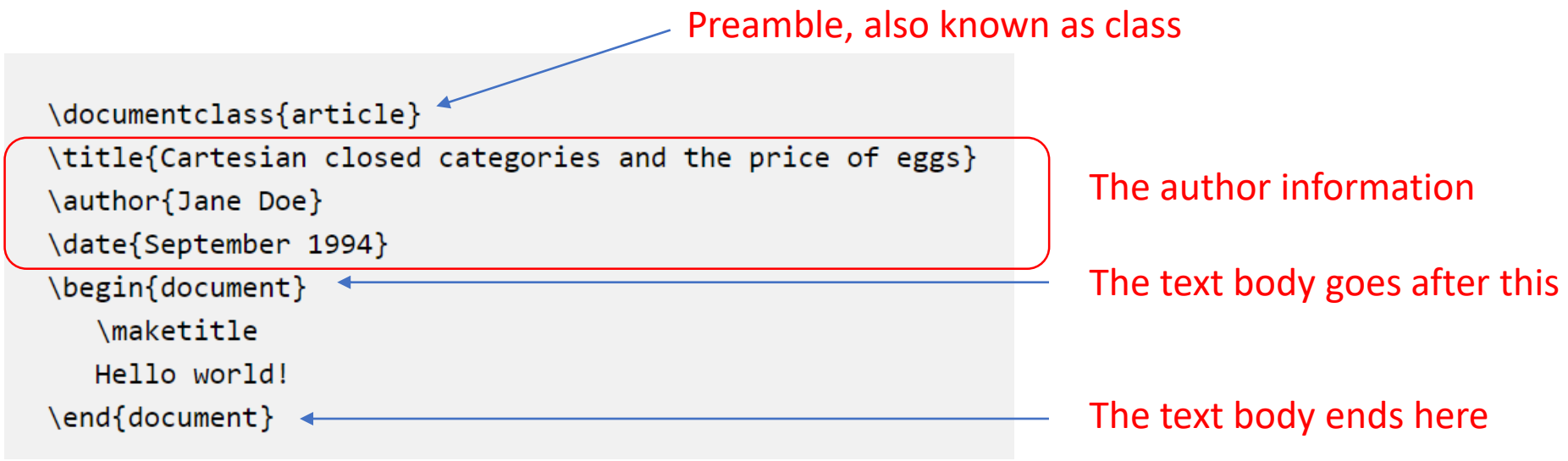
```
\documentclass{article}
\title{Cartesian closed categories and the price of eggs}
\author{Jane Doe}
\date{September 1994}
\begin{document}
   \maketitle
   Hello world!
\end{document}
```

The author information

The text body goes after this

The text body ends here

# Getting started




Every document starts with \documentclass

The { } tells LaTeX what kind of document is this…
Could be article, letter, book, presentation…

# Getting started

```
\begin{itemize}
\item Tea
\item Milk
\item Biscuits
\end{itemize}
```

- Tea
- Milk
- Biscuits

```
\begin{figure}
\includegraphics{gerbil}
\end{figure}
```

```
\begin{equation}
\alpha + \beta + 1
\end{equation}
```

$$\alpha + \beta + 1 \quad (1)$$

# Overleaf

- Overleaf is a website with a built in LaTeX compiler and text editor.
- It compiles your commands and the input text. Otherwise, you need to install LaTeX packages in your local machine for compiling.
  - For Windows, the most used compiler is MikeTeX. There are several nice user friendly editors such as TeXStudio.
- Overleaf is free for personal use, with limited collaboration facility
- Yale has license for Professional version with a collaboration feature

https://www.overleaf.com/edu/yale

# Typesetting mathematics

- Use caret ^ for superscripts and underscore _ for subscripts.

```
$y = c_2 x^2 + c_1 x + c_0$
```

$y = c_2 x^2 + c_1 x + c_0$

- Use curly braces { } to group superscripts and subscripts.

```
$F_n = F_n-1 + F_n-2$      % oops!

$F_n = F_{n-1} + F_{n-2}$ % ok!
```

$F_n = F_n - 1 + F_n - 2$

$F_n = F_{n-1} + F_{n-2}$

- There are commands for Greek letters and common notation.

```
$\mu = A e^{Q/RT}$

$\Omega = \sum_{k=1}^{n} \omega_k$
```

$\mu = Ae^{Q/RT}$

$\Omega = \sum_{k=1}^{n} \omega_k$

# Typesetting mathematics

- If it's big and scary, *display* it on its own line using \begin{equation} and \end{equation}.

```
The roots of a quadratic equation
are given by
\begin{equation}
x = \frac{-b \pm \sqrt{b^2 - 4ac}}
         {2a}
\end{equation}
where $a$, $b$ and $c$ are \ldots
```

The roots of a quadratic equation are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (2)$$

where $a$, $b$ and $c$ are ...

Caution: LaTeX mostly ignores your spaces in mathematics, but it can't handle blank lines in equations — don't put blank lines in your mathematics.

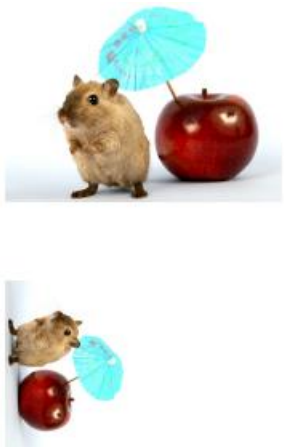
# Figure environment

- Needs an external package called 'graphicx'. The command is
  \usepackage{graphicx}

- The figure is added using \includegraphics[options]{filename}
- Example:

```
\includegraphics[
  width=0.5\textwidth]{gerbil}

\includegraphics[
  width=0.3\textwidth,
  angle=270]{gerbil}
```



# Figure environment

- Needs an external package called 'graphicx'. The command is
  \usepackage{graphicx}

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- Example:

```
\documentclass{article}
\usepackage{graphicx}
\begin{document}

Figure \ref{fig:gerbil} shows \ldots

\begin{figure}
\centering
\includegraphics[%
  width=0.5\textwidth]{gerbil}
\caption{\label{fig:gerbil}Aww\ldots.}
\end{figure}

\end{document}
```

Figure 1: Aww....

Figure 1 shows ...

# Tables

- Tables in LaTeX take some getting used to.
- Use the `tabular` environment from the `tabularx` package.
- The argument specifies column alignment — **l**eft, **r**ight, **r**ight.

```
\begin{tabular}{lrr}
Item    & Qty & Unit \$ \\
Widget & 1   & 199.99  \\
Gadget & 2   & 399.99  \\
Cable  & 3   & 19.99   \\
\end{tabular}
```

| Item | Qty | Unit $ |
|---|---|---|
| Widget | 1 | 199.99 |
| Gadget | 2 | 399.99 |
| Cable | 3 | 19.99 |

- It also specifies vertical lines; use `\hline` for horizontal lines.

```
\begin{tabular}{|l|r|r|} \hline
Item    & Qty & Unit \$ \\\hline
Widget & 1   & 199.99  \\
Gadget & 2   & 399.99  \\
Cable  & 3   & 19.99   \\\hline
\end{tabular}
```

| Item | Qty | Unit $ |
|---|---|---|
| Widget | 1 | 199.99 |
| Gadget | 2 | 399.99 |
| Cable | 3 | 19.99 |

- Use an ampersand [&] to separate columns and a double backslash [\] [\] to start a new row

# Bibliography

- Put your references in a `.bib` file in 'bibtex' database format:

```
@Article{Jacobson1999Towards,
  author = {Van Jacobson},
  title = {Towards the Analysis of Massive Multiplayer Online
           Role-Playing Games},
  journal = {Journal of Ubiquitous Information},
  Month = jun,
  Year = 1999,
  Volume = 6,
  Pages = {75--83}}

@InProceedings{Brooks1997Methodology,
  author = {Fredrick P. Brooks and John Kubiatowicz and
            Christos Papadimitriou},
  title = {A Methodology for the Study of the
           Location-Identity Split},
  booktitle = {Proceedings of OOPSLA},
  Month = jun,
  Year = 1997}
```

- Most reference managers can export to bibtex format.

# Bibliography

- Each entry in the `.bib` file has a *key* that you can use to reference it in the document. For example, `Jacobson1999Towards` is the key for this article:

```
@Article{Jacobson1999Towards,
  author = {Van Jacobson},
  ...
}
```

- It's a good idea to use a key based on the name, year and title.
- LaTeX can automatically format your in-text citations and generate a list of references; it knows most standard styles, and you can design your own.

Inside the main document of the TeX file, use \cite{article_key} such as \cite{Jacobson1999Towards} to cite the article.

# Some useful links

- For symbols and math-characters:

  http://detexify.kirelabs.org/classify.html

- To generate tables from existing data:

  https://www.tablesgenerator.com/

- LaTeX community forum:

  https://latex.org/forum/

- For package information and help files:

  https://ctan.org/

Also, Google is another important resource for finding any helps in blogs and other forum