

Document structure

```
\documentclass{article}
\usepackage{amsmath}
```

```
\begin{document}
Hello, world!
\end{document}
```

The smallest complete document. The preamble (before `\begin{document}`) loads packages.

```
\title{My paper}
\author{Ada Lovelace}
\maketitle
```

Title block; `\maketitle` goes after `\begin{document}`

```
\section{Introduction}
```

Numbered section (also `\subsection`, `\subsubsection`)

```
\section*{Acknowledgements}
```

Starred: no number, not in the contents

```
\tableofcontents
```

Table of contents (compile twice)

```
% a comment
```

Everything after % on a line is ignored

```
\newpage
```

Start a new page

Text formatting

```
\textbf{bold}
```

bold

```
\textit{italic}
```

italic

```
\emph{emphasis}
```

emphasis

Italic, or upright inside italics

```
\underline{underlined}
```

underlined

```
\texttt{monospace}
```

monospace

```
\textsc{Small Caps}
```

SMALL CAPS

```
``quoted''
```

“quoted”

Two backticks, two apostrophes

```
pages 10--12
```

pages 10–12

En dash for ranges

```
wait---what?
```

wait—what?

Em dash

```
\% \& \$ \# \_ \{ \}
```

% & \$ # _ { }

Characters that need a backslash

```
Dr.~Smith
```

Dr. Smith

~ is a space that never breaks a line

```
\footnote{A note.}
```

Numbered footnote at the bottom of the page

```
\href{https://samskrift.com/}{a link}
```

Clickable link (hyperref package)

Lists

```
\begin{itemize}
\item First
\item Second
\end{itemize}
```

Bullet points

```
\begin{enumerate}
\item First
\item Second
\end{enumerate}
```

Numbered list

```
\begin{description}
\item[Term] Its meaning
\end{description}
```

Terms and definitions

Math mode

```
$E = mc^2$
```

$E = mc^2$

Inline math, inside a sentence

```
\[ a^2 + b^2 = c^2 \]
```

$a^2 + b^2 = c^2$

Displayed on its own line

```
\begin{equation}
e^{i\pi} + 1 = 0
\label{eq:euler}
\end{equation}
```

$e^{i\pi} + 1 = 0$

Numbered; refer to it with `\eqref{eq:euler}`

```
x^{2} x_{i} x_{i}^{2}
```

$x^2 x_i x_i^2$

Superscripts and subscripts; braces for more than one character

```
\frac{a}{b}
```

$\frac{a}{b}$

Fraction

```
\sqrt{x} \sqrt[3]{x}
```

$\sqrt{x} \sqrt[3]{x}$

Roots

```
\pm \times \cdot \div
```

$\pm \times \cdot \div$

Operators

```
\leq \geq \neq \approx \equiv
```

$\leq \geq \neq \approx \equiv$

Relations

```
\infty \partial \nabla \forall \exists
```

$\infty \partial \nabla \forall \exists$

Infinity, partial, nabla, for all, exists

```
\to \rightarrow \iff \mapsto
```

$\rightarrow \Rightarrow \iff \mapsto$

Arrows

```
\text{if } x > 0
```

if $x > 0$

Upright words inside math

```
a\,b\; c\quad d\qquad e
```

$a\,b\,c\,d\,e$

Spaces: thin, medium, quad, double quad

Greek letters

```
\alpha \beta \gamma \delta \epsilon
```

$\alpha \beta \gamma \delta \epsilon$

```
\zeta \eta \theta \lambda \mu
```

$\zeta \eta \theta \lambda \mu$

```
\pi \rho \sigma \tau \phi
```

$\pi \rho \sigma \tau \phi$

```
\chi \psi \omega \varepsilon \varphi
```

$\chi \psi \omega \varepsilon \varphi$

var- forms are the alternative shapes

```
\Gamma \Delta \Theta \Sigma \Omega
```

$\Gamma \Delta \Theta \Sigma \Omega$

Capitals: capitalise the command

Sums, integrals and limits

`\sum_{i=1}^n i`

Sum (bounds go above and below when displayed)

`\prod_{k=1}^n k`

Product

`\int_0^1 x^2 \, dx`

Integral; \, adds the thin space before dx

`\iint_D f \, dA \quad \oint_C F \cdot dr`

Double and contour integrals

`\lim_{x \to 0} \frac{\sin x}{x}`

Limit

`\frac{d}{dx} \quad \frac{\partial f}{\partial x}`

Derivatives

Brackets

`\left( \frac{a}{b} \right)`

`\left` and `\right` grow to fit

`\{ x \mid x > 0 \}`

Braces need a backslash

`\angle x, y \quad \langle x, y \rangle`

Angle brackets

`|x| \quad \|v\|`

Absolute value, norm

`\lfloor x \rfloor \quad \lceil x \rceil`

Floor, ceiling

Matrices and cases

`\begin{pmatrix} a & b \\ c & d \end{pmatrix}`

Parentneses (bmatrix: brackets, vmatrix: determinant)

`|x| = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}`

Piecewise definition

Aligned equations

`\begin{align} f(x) &= (x + 1)^2 \\ &= x^2 + 2x + 1 \end{align}`

$$f(x) = (x + 1)^2 = x^2 + 2x + 1$$

& marks where lines line up; \\ ends a line; align* has no numbers

Fonts and accents in math

`\mathbb{R} \quad \mathbb{N} \quad \mathbb{Z}`

Blackboard bold (amssymb)

`\mathbf{v} \quad \mathcal{L} \quad \mathrm{d}x`

Bold, calligraphic, upright

`\vec{v} \quad \hat{x} \quad \bar{x} \quad \dot{x} \quad \tilde{x}`

Accents

`\overline{AB} \quad \underbrace{a + b}_n`

Tables

`\begin{tabular}{lcr} \toprule Left & Centre & Right \\ \midrule a & b & c \\ \bottomrule \end{tabular}`

Columns l, c, r; & between cells; rules from booktabs

`\begin{table}[htbp] \centering % tabular here \caption{Results} \label{tab:results} \end{table}`

Floating table with a caption; refer to it with `\ref{tab:results}`

Figures

`\begin{figure}[htbp] \centering \includegraphics[width=0.8\linewidth]{plot.png} \caption{A plot} \label{fig:plot} \end{figure}`

Needs `\usepackage{graphicx}`; upload plot.png next to your .tex file

References and citations

`\label{sec:intro} \quad \ref{sec:intro}`

Label something, then refer to its number

`\eqref{eq:euler} \quad \pageref{fig:plot}`

Equation number in parentheses; page number

`\cite{knuth1984}`

Cite an entry from your .bib file

`\bibliographystyle{plain} \bibliography{refs}`

BibTeX: list cited works from refs.bib

`@book{knuth1984, author = {Donald E. Knuth}, title = {The TeXbook}, publisher = {Addison-Wesley}, year = {1984} }`

An entry in refs.bib