\textTeX – a document formatter

\textTeX: a macro package for the \TeX{} ($\tau\epsilon\chi$, "tech") typesetting system

\begin{itemize}
  \item excellent facilities for mathematical notation
  \item de-facto standard for preparing scientific publications in mathematical, physical, computing and engineering disciplines
\end{itemize}

\textbf{History:} Donald Knuth (Stanford CS) developed \TeX{} in mid 1970s, in SAIL, to typeset his "Art of Computer Programming" books, reimplemented it in Pascal in the mid 1980s (WEB, literate programming), was later ported to C. Leslie Lamport (SRI, DEC) wrote \LaTeX{} in early 1980s. Both now community maintained as \TeX{} Live open-source distribution.

Classic processing steps:

```
g1.eps g2.eps
```

```
g1.pdf g2.jpg
```

Modern alternative:

```
g1.pdf g2.pdf
```

These slides: prepared using the \textTeX\ beamer class.

\textTeX – features and benefits

\begin{itemize}
  \item Most popular mathematical typesetting language (subset imitations now also in: Word, MathJax, MediaWiki, etc.)
  \item Encourages logical markup ⇒ helps to maintain consistent style
  \item Plain-text source ⇒ easy to collaborate via version-control systems
  \item Command-line tool ⇒ easy to automate build (make)
  \item Use any plain-text editor you like (Emacs, vi, TeXworks, Word, etc.)
  \item Robust for large, complex documents (PhD thesis, books, etc.)
  \item Highly extensible (a Turing-complete macro programming language) ⇒ vast collection of add-on packages for special typesetting needs (figures, logic proofs, pseudo code, circuit diagrams, flow charts, chemical formulae, slides, chess positions, etc.)
  \item Computer Modern, etc. ⇒ free font families
  \item Mature, free, portable, open source, used by many science publishers
\end{itemize}
\documentclass[12pt]{article}
\setlength{\textwidth}{75mm}
\begin{document}
\section*{Introduction}
Mathematical formulæ such as $e^{i\pi} = -1$ or even
$$\Phi(z) = \frac{1}{\sqrt{2\pi}} \int_0^x e^{-\frac12 x^2}$$
were a real ‘pain’ to typeset until \textsc{Knuth}’s text formatter \TeX\ became available \cite{Knuth86}.

\begin{thebibliography}{9}
\bibitem{Knuth86} Donald E. Knuth: The \TeX\book. Addison-Wesley, 1986.
\end{thebibliography}
\end{document}
Grouping

The curly braces { and } serve two purposes in \TeX:

- **Lexical scope**: a { saves current state on a stack and } restores it, therefore state changes (e.g., font switch, variable assignment) inside a { ... } group last only until the }:

  This is a \textbf{\{bfsseries bold\}} statement.

- **Commands and macros** read for each argument either a single character or a group enclosed by { and }:

  Typeset \textbf{M} in \textbf{\{boldface\}}.

\TeX macros can have optional arguments, which are enclosed by [...]:

\texttt{\{makebox[80mm][c]{this is centered in a box 80 mm wide}}

Typewriting versus typesetting

The ASCII (ISO 646) 7-bit character set has only 94 graphic characters:

```
!"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNOPQRSTUVWXYZ\[\-
`abcdefghi jklmnopqrstuvwxyz\{\}~
```

They were chosen to cover the character repertoire of US typewriters and teletype printers. The standards committee added a few more symbols (\{\}\{\}_{\_}) in the hope that they will be useful for programming.

\TeX defines a number of shortcuts and macros to access the much larger set of "typographic" characters used by book printers.

These typographic characters still cannot be found on standard PC keyboard layouts, which were designed for 7-bit ASCII.

Changing font style manually

**Declaring shape, series, family (each independently):**

\texttt{\{mdseries\} Medium series \{upshape\} Upright shape}

\texttt{\{bfsseries\} Boldface series \{itshape\} Italic shape}

\texttt{\{rfamily\} Roman family \{alshape\} Slanted shape}

\texttt{\{sfamily\} Sans-serif family \{acsshape\} Small caps shape}

\texttt{\{ttfamily\} Typewriter family \{normalfont\} Normal style}

**Corresponding commands** that change the style only for their argument:

\texttt{\{textmd\{text\}} \texttt{\{mdseries\}} \texttt{\{textup\{text\}}} \texttt{\{upshape\}}

\texttt{\{textbf\{text\}} \texttt{\{bfsseries\}} \texttt{\{textit\{text\}}} \texttt{\{itshape\}}

\texttt{\{texttm\{text\}} \texttt{\{rfamily\}} \texttt{\{textsl\{text\}}} \texttt{\{alshape\}}

\texttt{\{textsf\{text\}} \texttt{\{sfamily\}} \texttt{\{texttt\{text\}}} \texttt{\{ttfamily\}} \texttt{\{textnormal\{text\}}} \texttt{\{normalfont\}}

**Change type size:**

\texttt{\{tiny\}} \texttt{\{small\}} \texttt{\{large\}} \texttt{\{huge\}}

\texttt{\{scriptsize\}} \texttt{\{ normalsize\}} \texttt{\{Large\}} \texttt{\{Huge\}}

\texttt{\{footnotesize\}} \texttt{\{ LARGE\}}

**For style consistency**: use such low-level font commands only exceptionally (e.g., title pages, special notations). Otherwise leave any font adjustments to higher-level semantic commands such as \texttt{\{emph\{text\}}} or \texttt{\{section\{heading\}}}.
Dashes

ASCII provides only a single combined hyphen-minus character, but typesetters distinguish carefully between several dash characters:

- ⇒ - hyphen U+002D
-- ⇒ – en dash U+2013
--- ⇒ — em dash U+2014
$-\$ ⇒ − minus U+2212

The hyphen (-) is the shortest of these and is used to combine separate words or split words across line-breaks.

The en dash (–) is often used to denote a range of numbers (as in pages 64–128), or – as in this example – as a punctuation dash.

The em dash is used—like this—as a punctuation dash, often without surrounding space, especially in US typography.

The minus (−) is a mathematical operator, whose shape matches the plus (+), unlike the hyphen or dashes. Compare: -+, −+, —+, +.

Quotation marks

Typewriters and ASCII offer only undirectional ‘single’ and “double” quotation marks, while typesetters use ‘curly’ and “directed” variants.

\TeX input files use the single quotation mark (‘) and the grave accent (´) to encode these, as well the mathematical ‘prime’ marker and the French accents:

`⇒ ' left quote U+2018
'⇒ ' right quote U+2019
“⇒ “ left doublequote U+201C
”⇒ ” right doublequote U+201D
$'\$ ⇒ ′ prime U+2032
\'u ⇒ ú acute accent U+00E6
\"u ⇒ ´ grave accent U+00F6

The apostrophe (it’s) is identical to the right single quotation mark.

In some older terminal fonts (especially of US origin), the ‘ and ’ characters have a compromise shape somewhere between the quotation marks ’’ and the accents `´.

Non-ASCII Symbols

¡ !` !
¿ ?`
œ \œ
Œ \OE
æ \ae
Æ \AE
˚ a
˚A
ø \o
Ø \O
l \l
L \L
ß \ss
\t{oo}
¸ o

d{o}
ø¯
b{o}

With \usepackage[utf8]{inputenc} such characters can also be entered as UTF-8 Unicode.

Space – the final frontier

Traditional English typesetting inserts a larger space at the end of a sentence. \TeX believes any space after a period terminates a sentence, unless it is preceded by an uppercase letter. Parenthesis are ignored.

This works often: J. F. Kennedy’s U.S. budget. Look!
But not always: E.g. NASA. Dr. K. Smith et al. agree.

To correct failures of this heuristic, use

- ⇒ no-break space
\⇒ \force normal space
\@ ⇒ following punctuation ends sentence

as in

E.g. \ NASA\@. Dr. K. Smith et al.\ agree.

E.g. NASA. Dr. K. Smith et al. agree.

Or disable the distinction of spaces with \frenchspacing.
Structure of a \LaTeX document

First select a document class and its options, e.g. with
\documentclass[12pt,a4paper]{article}

Publishers often provide authors with their own class as a *.cls file. Appendix A of The \LaTeX Companion explains how to write new class files. A popular class for presentation slides: beamer

Environment: group delimited by \begin{name} and \end{name}, e.g.
\begin{document}
...
\end{document}

Common environments: abstract, center, verbatim, itemize, enumerate, quote, tabular, equation, ...

Mark headings with
\section{...} \subsubsection{...} \subsection{...} \paragraph{...}
and \LaTeX will take care of font sizes, numbering, and table of contents.

\LaTeX list environments
\begin{itemize}
\item Mammals
  \begin{itemize}
  \item Dogs
  \item Ponys
  \end{itemize}
\item Insects
\item $+$ ...
\end{itemize}

\begin{enumerate}
\setcounter{enumi}{-1}
\item Fruits
  \begin{enumerate}
  \item Apples
  \item Cucumbers\label{c}
  \end{enumerate}
\item Veggies
(see also \ref{c})
\item $+$ ...
\end{enumerate}

Package enumitem adds many configuration options to these environments. (texdoc enumitem)

Verbatim text: quoting source code

Lines of source code: the verbatim environment disables all meta characters, uses a typewriter font and preserves space and line feed:
\begin{verbatim}
\$initial = substr($record->{'name'}, 0, 1);
\end{verbatim}

Do not indent a verbatim block (prints all whitespace). Keep \end{verbatim} on its own line.

Source code with math mode: alltt uses a typewriter font and preserves spaces and type sets mathematical expressions:
\begin{verbatim}
for $i:=1,...,n$
  print $x_i^2$
\end{verbatim}

Inline strings: use \verb+text+ to quote text inside a paragraph, where + is any character that does not occur in text. This also disables meta characters, preserves whitespace, and switches to a typewriter font.

You can't use \verb in command arguments, use \texttt{text} instead.
The \verb+text+ variant prints spaces as \texttt{\texttt{space}}. Fix single quotation mark: \usepackage{upquote}.

Tweaking and extending \LaTeX

\LaTeX behaviour can be changed by overwriting predefined variables and macros. This can be done

▶ in the preamble (between the \documentclass{...} and \begin{document} lines) ⇒ for the entire document
▶ anywhere in the document ⇒ the effect will last only until the end of the current group (i.e., the next } or \end{...})

Packages

A huge collection of extension packages exists for \LaTeX. Some merely define additional macros and environments, others rewrite parts of \LaTeX's internal machinery. For example, adding to the preamble
\usepackage{hyperref}
loads all the macros and settings defined in the hyperref.sty package.

hyperref adds new macros, such as \url{...} for typesetting URLs, but also automatically turns every reference to a page, section, or bibliographic entry into a hyperlink.

Documentation: texdoc packagename e.g. texdoc geometry
Example: changing page layout geometry

Adjust margins manually, via numerous length variables:
\setlength\oddsidemargin{-0.4mm} % 25 mm left margin
\setlength\evensidemargin{\oddsidemargin} % 25 mm right margin
\setlength\topmargin{-5.4mm} % 20 mm top margin
\setlength\headheight{5mm}
\setlength\headsep{5mm}
\setlength\footskip{10mm}
\setlength\textheight{237mm} % 20 mm bottom margin

More comfortable:
\usepackage[vmargin=20mm,hmargin=25mm]{geometry}
The \texttt{geometry.sty} package automatically recalculates any dimensions not specified.

Make paragraphs not indented at the first line, but spaced apart slightly:
\setlength\parindent{0mm}
\setlength\parskip{\medskipamount}
Or just:
\usepackage{parskip}

Mathematical typesetting

In \TeX, mathematical formulas are formatted in a completely different mode from that used for normal text.

Inline formulas such as $a_n$ that appear as part of a normal paragraph have to be surrounded with $\ldots$ or $\langle \ldots \rangle$, while $\langle \ldots \rangle$ produces a displayed formula, such as

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

In math mode

- space characters are ignored; \TeX adds its own space around operators based on heuristics; manually add thin space with \texttt{\,};
- a special math italic font is used, with different inter-character spacing, designed for single-letter variables concatenated in products
- many additional macros for special symbols are defined

Math italic is very different and not suitable for writing words or units! Use \texttt{\textbackslash mathrm{...}} around words, as in $v_{\text{diff}}$.

Macros for neatly aligning multiple equations: \texttt{\usepackage{amsmath}}, see \texttt{texdoc amsldoc}.

Mathematical symbols

Greek letters

| \( \Gamma \) | \texttt{Gamma} | \( \delta \) | \texttt{delta} | \( \pi \) | \texttt{pi} |
| \( \Delta \) | \texttt{Delta} | \( \epsilon \) | \texttt{epsilon} | \( \varphi \) | \texttt{varphi} |
| \( \Theta \) | \texttt{Theta} | \( \varepsilon \) | \texttt{varepsilon} | \( \rho \) | \texttt{rho} |
| \( \Lambda \) | \texttt{Lambda} | \( \zeta \) | \texttt{zeta} | \( \sigma \) | \texttt{sigma} |
| \( \Xi \) | \texttt{Xi} | \( \eta \) | \texttt{eta} | \( \varsigma \) | \texttt{varsigma} |
| \( \Pi \) | \texttt{Pi} | \( \theta \) | \texttt{theta} | \( \varsigma \) | \texttt{varsigma} |
| \( \Sigma \) | \texttt{Sigma} | \( \vartheta \) | \texttt{vartheta} | \( \tau \) | \texttt{tau} |
| \( \Upsilon \) | \texttt{Upsilon} | \( \iota \) | \texttt{iota} | \( \upsilon \) | \texttt{upsilon} |
| \( \Phi \) | \texttt{Phi} | \( \kappa \) | \texttt{kappa} | \( \phi \) | \texttt{phi} |
| \( \Psi \) | \texttt{Psi} | \( \lambda \) | \texttt{lambda} | \( \varphi \) | \texttt{varphi} |
| \( \Omega \) | \texttt{Omega} | \( \mu \) | \texttt{mu} | \( \chi \) | \texttt{chi} |
| \( \alpha \) | \texttt{alpha} | \( \nu \) | \texttt{nu} | \( \psi \) | \texttt{psi} |
| \( \beta \) | \texttt{beta} | \( \xi \) | \texttt{xi} | \( \omega \) | \texttt{omega} |
| \( \gamma \) | \texttt{gamma} | \( \circ \) | \texttt{circ} |

Mathematical symbols

Binary operators

| \( \pm \) | \texttt{pm} | \( \uparrow \) | \texttt{uparrow} | \( \cap \) | \texttt{cap} | \( \oplus \) | \texttt{oplus} |
| \( \mp \) | \texttt{mp} | \( \bigcup \) | \texttt{bigcup} | \( \ominus \) | \texttt{ominus} |
| \( \setminus \) | \texttt{setminus} | \( \bigcap \) | \texttt{bigcap} | \( \otimes \) | \texttt{otimes} |
| \( \cdot \) | \texttt{cdot} | \( \bigtriangledown \) | \texttt{bigtriangledown} | \( \oslash \) | \texttt{oslash} |
| \( \times \) | \texttt{times} | \( \bigcup \) | \texttt{bigcup} | \( \odot \) | \texttt{odot} |
| \( \ast \) | \texttt{ast} | \( \bigcirc \) | \texttt{bigcirc} | \( \dagger \) | \texttt{dagger} |
| \( \star \) | \texttt{star} | \( \bigcirc \) | \texttt{bigcirc} | \( \ddagger \) | \texttt{ddagger} |
| \( \diamond \) | \texttt{diamond} | \( \bigcirc \) | \texttt{bigcirc} | \( \equiv \) | \texttt{equiv} |
| \( \circledast \) | \texttt{circledast} | \( \bigcirc \) | \texttt{bigcirc} | \( \neq \) | \texttt{neq} |
| \( \div \) | \texttt{div} | \( \bigwedge \) | \texttt{bigwedge} | \( \triangleleft \) | \texttt{triangleleft} |

Macros for neatly aligning multiple equations: \texttt{\usepackage{amsmath}}, see \texttt{texdoc amsldoc}.
Mathematical symbols

Relations

\leq \equiv \succ \preceq \ll \lll \in \triangleright \ldots 
\not< \not= \not\geq \not\succ \not\equiv \not\lll 
\not\leq \not\preceq \not\ll \not\in \not\triangleright \not\ldots

Mathematical symbols

\aleph \prime \forall \forall \bigcap \bigcap
\hbar \emptyset \exists \exists \bigcup \bigcup
\imath \nabla \neg \neg \bigcirc \bigcirc
\jmath \sqrt \flat \flat \bigcirc \bigcirc
\ell \top \natural \natural \bigcirc \bigcirc
\wp \bot \sharp \sharp \bigcirc \bigcirc
\Re \clubsuit \angle \diamondsuit \angle \diamondsuit
\Im \top \heartsuit \heartsuit \diamondsuit \diamondsuit
\partial \backslash \spadesuit \spadesuit \backslash \backslash
\infty \Join \Diamond \Diamond \Join \Join

\ldots \ldots \ldots \vdots \ddots

Use \ldots in a, b, \ldots, z, but \cdots in a + b + \cdots + z. Never write ...  

Large operators and delimiters

\sum \bigcup \bigcup \bigcup \bigcup \bigcup \bigcup \bigcup \bigcup
\prod \bigcap \bigcap \bigcap \bigcap \bigcap \bigcap \bigcap \bigcap
\coprod \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc
\bigvee \bigwedge \bigwedge \bigwedge \bigwedge \bigwedge \bigwedge \bigwedge \bigwedge

These appear smaller inline than in displayed equations: \prod_{i=0}^{n-1} vs \prod_{i=0}^{n-1}

\lbrack \rbrack \lbrack \rbrack \lbrack \rbrack \lbrack \rbrack
\langle \rangle \langle \rangle \langle \rangle \langle \rangle

\left( \sum_{i=0}^{\infty} x^i \right)

\left( \sum_{i=0}^{\infty} x^i \right)
Mathematical symbols

**Alternative names**

\ne \ne
\text{\owns}
\land \lor
\vert \Vert
\overline{a-b}
\underline{a-b}
\overbrace{a-b}
\underbrace{a-b}_c
\frac{a}{b}
\begin{array}{cl}
  a^{2^2}, & a \ge 0 \\
  -\frac{1}{a^2}, & a < 0
\end{array}

**Stacking things**

\begin{align*}
  a^b & \quad a^{-\{b\}} \\
  a-b & \quad \overline{a-b} \\
  a-b & \quad \underline{a-b}
\end{align*}

**Postscript/PDF graphics facilities**

**Applying coordinate transforms:**

The graphicx package provides access to the geometric transform capabilities of the PostScript and PDF languages:

\begin{verbatim}
\scalebox{0.8}{\includegraphics{diagram.pdf}}
\includegraphics[height=60mm]{screenshot.png}
\includegraphics[width=0.9\linewidth]{photo.jpg}
\resizebox{190mm}{60mm}{becomes 19 cm $\times$ 6 cm large}
\rotatebox{180}{this is upside down!}
\end{verbatim}

**Changing colours:**

The color package also uses Postscript/PDF special commands:

This text is \textcolor{red}{printed in red} if ...

This text is printed in red if you include \usepackage{color}.

Default: \definecolor{red}{rgb}{1,0,0}

**Including graphics**

DVI only supports characters and filled rectangles, but dvips and pdftex also understand embedded “special” instructions that provide more.

**Embedded PostScript (EPS) vector graphics:**

Normal PostScript files (*.ps) produce a sequence of pages. An EPS file describes only an image and is meant to be included into a PostScript page. EPS files lack instructions to output paper, but define a rectangular “bounding box”, using special \%BoundingBox: comments.

Load the graphicx extension of \LaTeX{} by adding

\begin{verbatim}
\usepackage{graphicx}
\end{verbatim}

to the preamble. Then write

\begin{verbatim}
\includegraphics{filename.eps}
\end{verbatim}

wherever you want to include the graphics file into your text.

In pdflatex, the graphicx package allows you to include graphics from PDF (vector graphics), JPEG (photos) and PNG (bitmap) files:

\begin{verbatim}
\includegraphics{filename.pdf}
\end{verbatim}

**Figures and references**

Larger diagrams interfere with page breaking. They are best placed into a \texttt{figure} environment, such that \LaTeX{} can move them around. Example:

\begin{verbatim}
\begin{figure}
\includegraphics[width=0.6\linewidth]{photo.jpg}
\caption{This photograph shows the experimental setup.}
\label{fig:expsetup}
\end{figure}
\end{verbatim}

The automatically assigned figure number can be quoted as in:

See also Figure\ref{fig:expsetup}.

The \label{...} command can also be used after \section{...}, \subsection{...}, etc. and inside \begin{equation}... \end{equation} to assign symbolic names to section and equation numbers, which can then be resolved via \ref{...} or \pageref{...}.

No need to manually renumber figures, sections, or equations!
Build tools for \LaTeX

To make sure \texttt{\label} references and tables of contents use the correct numbers, it may be necessary to call \texttt{latex} twice. It will output “Rerun to get cross-references right” in this case.

The following implicit Makefile rule takes care of this:

\begin{verbatim}
.DELETE_ON_ERROR:
\%
%.pdf %.aux %.idx: %.tex
  pdflatex $<
  while grep 'Rerun to get ' $*.log; do pdflatex $<; done
\end{verbatim}

An alternative is the “\texttt{latexmk}” tool, which automatically determines dependencies (e.g. from \texttt{\includegraphics}) and recompiles \LaTeX{} documents where file modification timestamps indicate that this is necessary.

Graphics editor \texttt{xfig}

\begin{itemize}
  \item Its *.fig files have a simple plain-text format that can be edited manually, script generated, and leads to useful diffs.
  \item Can export *.eps or *.pdf files
  \item Can also produce figures in which \LaTeX{} is used to fill in all the text. This provides math mode, macros, symbols, references, fonts that match the main text, etc.
  \end{itemize}

Ask \texttt{xfig} to export a *.pstex + *.pstex.t file pair. The *.pstex file lacks the text parts of the figure. The *.pstex.t file contains \LaTeX{} commands that first load the *.pstex image, and then add all the text in the figure. Select the “special text” mode in \texttt{xfig} to enable \LaTeX{} metacharacters. Use \texttt{\include{*.pstex_t}} to add such a figure in your document. (PDF equivalent: *.pdftex + *.pdftex_t)

\begin{verbatim}
\%
 eps: %.fig
  fig2dev -L eps $< $@

 pstex: %.fig
  fig2dev -L pstex_t -p *.pstex $< $*.pstex_t
  fig2dev -L pstex $< $*.pstex
tex: %.fig
  fig2dev -L pdftex_t -p *.pdftex $< $*.pdftex_t
  fig2dev -L pdftex $< $*.pdftex
\end{verbatim}

Other graphics tools: \texttt{TikZ}, \texttt{pnmtops}, \texttt{Inkscape}, \texttt{MATLAB}, \texttt{R}, \texttt{gnuplot}, \texttt{Python+matplotlib}

Bibliographic references

Academic writing: detailed references to prior work
\begin{itemize}
  \item to support arguments
  \item to document familiarity with the field
  \item to help newcomers to the field
  \item to give due academic credit
  \item to join the bibliometric graph of the field (recommendation systems)
  \item to trigger notifications to cited authors (e.g. Google Scholar alerts)
\end{itemize}

A bibliographic reference needs to contain all information needed to help readers (and increasingly search engines!) to unambiguously identify and locate the text referred to. Minimum: First two authors, full title, date, indication of type of publication (usually implicitly via other details).

Inter-library loan required many details: names and location of publishers or the volume, issue and page numbers in printed journals. Today, most readers retrieve scientific publications (with the exception of books) digitally, so online identifiers such as URIs or DOIs are more important instead.

Many URLs (e.g., to author’s home pages, “grey literature”) do not last long, but can still later be retrieved via archival services (e.g., archive.org). Therefore: accompany URLs with the date on which you accessed them. Try to HTTP redirect your own URLs when moving web space.

Bibliographic references – styles

Four widely used styles:
\begin{itemize}
  \item [short-title] – most common in books on humanities, e.g. “Hart, Hart’s Rules, p. 52”
  \item [author-date] – most common in science and social science, e.g. “Goossens (1997)” or “(Goossens, 1997b)”.
  \item [author-number] – follows the name of the author(s) with a per-author number (rare with \LaTeX{}), e.g. “Goossens (2)”
  \item [number-only] – all publications sequentially numbered in bibliography, made popular by \LaTeX{}, now very widely used in computer science, e.g. “[67]”.
\end{itemize}

Collect full references at the end of the document (bibliography), each chapter, or page of first mention (footnotes).

With number-only bibliography: for important work, include author(s) name and year in first mention in the text. Avoid abusing numerical references like a noun (bad: “as shown by [17]”, nice: “as Knuth showed in 1988 [17]”).

When referencing books, also include a chapter or page number.
Bibliographic references – manual approach

\LaTeX can also manage numerical references to a bibliography.

Append near the end of your document (usually after conclusions and before appendices) your list of bibliographic items, assigning each an alphanumeric identifier:

\begin{thebibliography}{9}
\end{thebibliography}

Then refer to these in the text using \cite:

Finer details on the use of en"dashes are explained by Lamport\cite{Lamport94} or Dupre\cite{Dup98}.\cite can take an optional note in [], e.g. for a page or section number.\cite can take an optional label in [].\begin{thebibliography}{99} needs a "widest label" as an argument to plan indentation.

Example *.bib file entry

@TechReport{UCAM-CL-TR-123,  
  author = {Herbert, John},  
  title = {Case Study of the Cambridge Fast Ring ECL Chip using HOL},  
  year = 1988,  
  month = feb,  
  institution = {University of Cambridge, Computer Laboratory},  
  number = {UCAM-CL-TR-123}  
}

Important: Many U.S. publishers' house styles use "title case" for publication titles, where most words (other than short articles and prepositions) start with a capital letter.

This form of emphasis is not appropriate for bibliographic references, therefore many \texttt{BibTeX} styles convert titles to lowercase.

Protect names (proper nouns) and acronyms in titles from automatic lowercase-ification by surrounding them with {...}.

Title case: Case Study of the Cambridge Fast Ring ECL Chip using HOL
Sentence case: Case study of the Cambridge Fast Ring ECL chip using HOL
Bad-Bib\TeX case: Case study of the cambridge fast ring ecl chip using hol

Exercise 1: Copy file example.tex from slide 9, run "pdflatex example" twice (why?), and then "okular example.pdf &" (Linux) to see the output.

Exercise 2: Read pages 1–64 of the \LaTeX\ book, then write your CV with \LaTeX, convert the result into PDF, and put it onto your homepage.

For information on how to set up homepages locally: https://www.srcf.net/

Exercise 3: In a job interview for a position as a subeditor of a technical journal, your skills in spotting typographic mistakes made by \LaTeX\ beginners are tested with this example text:

The $-7$ dB loss ($\pm 2$ dB) shown on pp. 7-9 can be attributed to the $f(t)$ = $\sin(2\pi ft)$ signal, where $t$ is the the time and $f = 48$KHz is the "sampling frequency".

Can you spot all 14 mistakes? Write down both the probable original incorrect \LaTeX source text, as well as a corrected version.

Automatic compilation of references with Bib\TeX

Consider using \texttt{BibTeX} if you

\begin{itemize}
  \item expect to write several publications, sharing many references, each formatted to different house styles;
  \item want number-only references sorted in order of first reference;
  \item want automatic author-year references (use package \texttt{natbib})
  \item want to use a reference database
\end{itemize}

Provide \texttt{.bib} bibliographic database files and a \texttt{.bst} bibliographic style file (often provided by publisher). Load these as in

\\begin{verbatim}
\bibliography{articles,group-refs}
\bibliographystyle{unsrt}
\end{verbatim}

Details:

Lamport, Section 4.3 and Appendix B. \LaTeX Companion, Chapter 12.

Example *.bib file entry

@TechReport{UCAM-CL-TR-123,  
  author = {Herbert, John},  
  title = {Case Study of the Cambridge Fast Ring ECL Chip using HOL},  
  year = 1988,  
  month = feb,  
  institution = {University of Cambridge, Computer Laboratory},  
  number = {UCAM-CL-TR-123}  
}

Important: Many U.S. publishers' house styles use "title case" for publication titles, where most words (other than short articles and prepositions) start with a capital letter.

This form of emphasis is not appropriate for bibliographic references, therefore many \texttt{BibTeX} styles convert titles to lowercase.

Protect names (proper nouns) and acronyms in titles from automatic lowercase-ification by surrounding them with {...}.

Title case: Case Study of the Cambridge Fast Ring ECL Chip using HOL
Sentence case: Case study of the Cambridge Fast Ring ECL chip using HOL
Bad-Bib\TeX case: Case study of the cambridge fast ring ecl chip using hol

Exercise 1: Copy file example.tex from slide 9, run "pdflatex example" twice (why?), and then "okular example.pdf &" (Linux) to see the output.

Exercise 2: Read pages 1–64 of the \LaTeX\ book, then write your CV with \LaTeX, convert the result into PDF, and put it onto your homepage.

For information on how to set up homepages locally: https://www.srcf.net/

Exercise 3: In a job interview for a position as a subeditor of a technical journal, your skills in spotting typographic mistakes made by \LaTeX\ beginners are tested with this example text:

The $-7$ dB loss ($\pm 2$ dB) shown on pp. 7-9 can be attributed to the $f(t)$ = $\sin(2\pi ft)$ signal, where $t$ is the the time and $f = 48$KHz is the "sampling frequency".

Can you spot all 14 mistakes? Write down both the probable original incorrect \LaTeX source text, as well as a corrected version.