Introduction to \LaTeX

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Overview

What is \LaTeX?  
A “markup” language for typesetting

What are its key features? 
Flexibility; mathematical typesetting; community support

Where do I get the software? 
\TeXLive DVD or \TeX Users Group online

How do I learn to use it? 
Reference manuals/books, online sources, . . .
Learning about \LaTeX

  http://proxy.library.eiu.edu:2932/9780321617736/


- Getting Started with TeX, \LaTeX, and Friends:
  http://www.tug.org/begin.html

- \LaTeX (a Wikibook):
  http://en.wikibooks.org/wiki/LaTeX
A few \TeX\ front-ends

\TeXShop

Mac

\TeXworks

Mac, Windows, Linux
Every document has a **preamble** and a **body**.
Some useful packages

\usepackage{amsmath} % AMS enhancements
\usepackage{amsthm} % theorem environments
\usepackage{amssymb,latexsym} % more symbols
\usepackage{graphicx} % Graphics inclusion

Packages are declared in the preamble of the \LaTeX source file.
These characters have special meaning:

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

A `\` prefix avoids this special meaning:

```
\#  \$  \&  \_  \%  \{  \}
```
\texttt{\textbackslash command[optional]{required}}

or

\texttt{\textbackslash command[optional]{required}{required}}

Examples:

\texttt{\textbackslash section{Introduction}}
\texttt{\textbackslash hspace{2in}}
\texttt{\textbackslash rule[0.5in]{1in}{2in}}
\begin{environment-name}
...
\end{environment-name}

Examples:

- quote
- center
- enumerate
- itemize
- tabular
The itemize environment

\begin{itemize}
  \item Planes
  \item Trains
  \item Automobiles
\end{itemize}

<table>
<thead>
<tr>
<th>Latex code</th>
<th>Typeset result</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>\begin{itemize}</code></td>
<td></td>
</tr>
<tr>
<td><code>\item Planes</code></td>
<td><code>Planes</code></td>
</tr>
<tr>
<td><code>\item Trains</code></td>
<td><code>Trains</code></td>
</tr>
<tr>
<td><code>\item Automobiles</code></td>
<td><code>Automobiles</code></td>
</tr>
</tbody>
</table>
The enumerate environment

\begin{enumerate}
  \item Planes
  \item Trains
  \item Automobiles
\end{enumerate}

1. Planes
2. Trains
3. Automobiles
Adjusting font attributes

\textbf{\LaTeX} code

\ldots normal, \textit{emphasized}, \textbf{bold}, \texttt{typewriter}, normal\ldots

Typeset result

\ldots normal, \textit{emphasized}, \textbf{bold}, \texttt{typewriter}, normal\ldots
\begin{tabular}{l|c|r}
President & Party & Term \\
\hline
Jimmy Carter & Democrat & 1977--1981 \\
Abraham Lincoln & Republican & 1861--1865 \\
\end{tabular}

<table>
<thead>
<tr>
<th>President</th>
<th>Party</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abraham Lincoln</td>
<td>Republican</td>
<td>1861–1865</td>
</tr>
</tbody>
</table>
In-line mathematics: mixed with text

\[ ...$ mathematics text $ ...\]

From algebra, we know \((a + b)^2 = a^2 + 2ab + b^2\) for any two real numbers \(a\) and \(b\).

Displayed mathematics: set off from text

\[ ...\[ mathematics text \]\ ...\]

From algebra, we know

\[(a + b)^2 = a^2 + 2ab + b^2\]

for any two real numbers \(a\) and \(b\).
Subscripts and superscripts

**LaTeX code**

\[\begin{aligned}
&x^2 + y^2 \\
&\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
&\int_0^\pi x^2 \, dx \\
&\displaystyle \int_0^\pi x^2 \, dx
\end{aligned}\]

**Typeset result**

\[
\begin{align*}
&x^2 + y^2 \\
&\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
&\int_0^\pi x^2 \, dx \\
&\int_0^\pi x^2 \, dx
\end{align*}
\]
More about subscripts and superscripts

**\LaTeX** code

\[$2^{a + b}\$\]
\[$A_{i + 1,j}\$\]
\[$2^{2^{2^{n}}}\$\]
\[$A_{i, j}^{k}\$\]

**Typeset result**

\[2^{a+b}\]
\[A_{i+1,j}\]
\[2^{2^{2^{n}}}\]
\[A_{i,j}^{k}\]
Aligning multi-line equations

\textbf{\LaTeX} code

\begin{align*}
(a+b)(a-b) &= a^2 - ab + ab - b^2 \\
&= a^2 - b^2 \\
\end{align*}

Typeset result

\[(a + b)(a - b) = a^2 - ab + ab - b^2 = a^2 - b^2\]
Aligning multi-line equations with side notes

\begin{align*}
(a+b)(a-b) &= a^2 - ab + ab - b^2 && \text{Side} \\
           &= a^2 - b^2 && \text{notes}
\end{align*}

\textbf{Typeset result}

\[(a + b)(a - b) = a^2 - ab + ab - b^2 \quad \text{Side}
\]
\[= a^2 - b^2 \quad \text{notes}\]
A few functions

\begin{align*}
\cos, \log, \lim, \ln, \log, \sin, \tan
\end{align*}

\textsc{\LaTeX} code

\begin{align*}
\sin^2 x + \cos^2 x &= 1
\end{align*}

\textbf{Typeset result}

\begin{align*}
\sin^2 x + \cos^2 x &= 1
\end{align*}
Fractions

\[ \frac{numerator}{denominator} \]

LaTeX code

\[ \frac{a^2 - b^2}{a + b} = a - b \]

Typeset result

\[
\frac{a^2 - b^2}{a + b} = a - b
\]
A few relations
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>\alpha \beta \gamma \delta \epsilon</td>
<td>\alpha \beta \gamma \delta \epsilon</td>
</tr>
<tr>
<td>\Gamma \Delta \Theta \Sigma \Omega</td>
<td>\Gamma \Delta \Theta \Sigma \Omega</td>
</tr>
</tbody>
</table>
Including graphics

Suppose you have a graphics file named \texttt{sine.pdf}

\texttt{\includegraphics[width=2.5in]{sine}}

Graphics files can be generated and exported by a wide variety of computer programs — this one is from Mathematica.
Typeset the sample page

Refer to Appendix B of Grätzer’s book