Revision

- \LaTeX{} is a document preparation system
  - Typesets documents

- Commands
  - Start with a backslash (`\`)

- Environments
  - `\begin{name}`
  - `\end{name}`

\begin{document}
...\end{document}

Text Styles

- \textbf{Argument will be bold}
- \textit{Argument will be italic}
- \textsl{Argument will be slanted}
- \textsf{Argument will be sans-serif}
- \texttt{Argument will be monospace}
- \textsc{Argument will be small capitals}

\textbf{emph versus \textit{textit}}

\emph{I want to \textit{emphasize this}}

\textit{I want to emphasize this}

\emph{I want to \emph{emphasize this}}

\textit{I want to \textit{emphasize this}}

\textbf{I want to \textbf{emphasize this}}
**Exercise**

What is the output of the following LaTeX code?

The \textbf{quick} \textit{brown} \textsl{fox} jumps \textsf{over} the \texttt{lazy} \textsc{Dog}

The quick brown fox jumps over the lazy Dog

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**Font Style**

- **Forms**
  - Declarative form (Set style from this point forward)
  - Environmental form (Create an environment that uses this style)

- \bfseries Bold
- \mdseries Normal weight (i.e. not bold)
- \itshape Italic
- \slshape Slanted
- \upshape Upright (opposite of slanted)
- \scshape Small Capitals
- \rmfamily Serif (roman)
- \sffamily Sans-serif
- \ttfamily Monospace (typewriter)

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**Example**

- Normal way to set italics
- \begin{sffamily}
  \textit{This text will be italic}
- \end{sffamily}

- Environment form
- \begin{itshape}
  This text is also italic
- \end{itshape}

- Declarative form
- \itshape
  All text from this point forward will be italic

---

**Exercise**

What would the output of the following code be?

\begin{sffamily}
The quick brown fox
\end{sffamily}

jumps over \bfseries the lazy dog

The quick brown fox
jumps over the lazy Dog
Font Size

<table>
<thead>
<tr>
<th>Command</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>\tiny</td>
<td>sample text</td>
</tr>
<tr>
<td>\scriptsize</td>
<td>sample text</td>
</tr>
<tr>
<td>\footnotesize</td>
<td>sample text</td>
</tr>
<tr>
<td>\small</td>
<td>sample text</td>
</tr>
<tr>
<td>\normalsize</td>
<td>sample text</td>
</tr>
<tr>
<td>\large</td>
<td>sample text</td>
</tr>
<tr>
<td>\LARGE</td>
<td>sample text</td>
</tr>
<tr>
<td>\textSmall</td>
<td>sample text</td>
</tr>
</tbody>
</table>

Example

\{\small This text is small\}
\{\Large\itshape This text is large and italic\}
{\tiny \textit{This text will be tiny and italic}}
\{This text will be tiny, but not italic.\}

Setting the scope of a command

- New way to apply a command
  - Set the scope of the command
  - Command only applies within the curly braces
  - Note: this works with the declarative forms for font style and font size

- Format:
  \{\command ... text goes here ... \}

Aligning paragraphs

- \textbf{flushleft}
  - Environment that aligns a paragraph to the left

- \textbf{flushright}
  - Environment that aligns a paragraph to the right

- \textbf{center}
  - Environment that aligns a paragraph to the centre

\begin{center}
furuike ya\\
kawazu tobikomu\\
mizu no oto\end{center}
\begin{center}
Three things are certain: Death, taxes, and lost data. Guess which has occurred!\end{center}
Unordered Lists

- **Unordered Lists**
  - List that uses bullet points
  - `itemize` environment
  - \item used to identify each item in the list

\begin{itemize}
\item Pears
\item Apples
\item Bananas
\end{itemize}

- Pears
- Apples
- Bananas

Ordered Lists

- **Ordered Lists**
  - List that is enumerated
  - `enumerate` environment
  - \item used to identify each item in the list

\begin{enumerate}
\item Pears
\item Apples
\item Bananas
\end{enumerate}

1. Pears
2. Apples
3. Bananas

Description Lists

- **Description Lists**
  - List that is used to define terms
  - `description` environment
  - \item[term] used to identify each term in the list

\begin{description}
\item[Pears] Say something really really long about fruit
\item[Apples] More fruit
\item[Bananas] Still more fruit
\end{description}

- Pears
  - Say something really really really long about fruit
- Apples
  - More fruit
- Bananas
  - Still more fruit

Quotes and Quotations

- **quote environment**
  - Used for short quotes
  - Entire environment is indented
  - The first line of a new paragraph inside `quote` is not indented.

```
This is a quote by Aristotle:
\begin{quote}
There is only one way to avoid criticism: do nothing, say nothing, and be nothing. - Aristotle
\end{quote}
```

- **quotation environment**
  - Used for longer quotes
  - Entire environment is indented
  - The first line of a new paragraph inside `quotation` is indented

```
This is a quote by Aristotle:
\begin{quotation}
There is only one way to avoid criticism: do nothing, say nothing, and be nothing. - Aristotle
\end{quotation}
```
Quote versus Quotation Example

This is a quote by Aristotle:
There is only one way to avoid criticism: do nothing, say nothing, and be nothing. - Aristotle

This is a quote by Aristotle:
There is only one way to avoid criticism: do nothing, say nothing, and be nothing. – Aristotle

Mathematics

• Three ways to enter mathematics mode
  – Inline text
    – $ ...$
  – displaymath environment
    – Centres the maths on a line of its own
  – equation environment
    – Centres the maths on a line of its own
    – Numbers the maths with an equation number

Examples

The equation $x = y$
is a simple equation.

The equation:
\begin{displaymath}
x = y \\
\end{displaymath}
is a simple equation.

The equation:
\begin{equation}
x = y \\
\end{equation}
is a simple equation.

The equation:
\begin{equation} (1.1) 
x = y \\
\end{equation}
is a simple equation.

Verbatim

• verbatim environment
  – Reproduces text exactly as it appears
  – Uses a monospace font (courier)
  – Often used for computer code
  – No latex commands can be used in verbatim

The following commands are used in LaTeX
\begin{verbatim}
Use \\ to create a line break. Use \section{ name } to create a new section.
\end{verbatim}
Laying out mathematics

- **Too many commands to memorise**
  - Look up the commands when we need them
  - Any symbol, any structure exists somewhere
  - We will look at the most common commands
  - To apply letters to a group, we put curly braces around them

- **Exponent**
  - Carat (^)
  - Example: \( n^{\text{th}} \)

- **Subscripts**
  - Underscore (_)
  - Example: \( s_0 \)

Other common functions

- **Square roots**
  - Example: \( \sqrt{x^2 + y^2} \)

- **Fractions**
  - Example: \( \frac{3}{2} \)

- **Sum**
  - Example: \( \sum_{k=1}^{n} k \)

Example

\[
\sum_{k=1}^{n} k = \frac{1}{2} n(n+1) = \frac{n(n+1)}{2}
\]

Example (continued)

If a quadratic equation is given by:

\[
f(x) = ax^2 + bx + c
\]

Then the formula for calculating the roots of a quadratic equation is:

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

Exercise

If a quadratic equation is given by:

\[
f(x) = ax^2 + bx + c
\]

Then the formula for calculating the roots of a quadratic equation is:

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]
Exercise

- Write the code that reproduces the following LaTeX:

The sum of a geometric series is:
\[
\sum_{k=0}^{n} ar^k = ar^0 + ar^1 + ar^2 + ar^3 + \ldots + ar^n
\]

We can rearrange the equation to produce the simple formula:
\[
\sum_{k=0}^{n} ar^k = \frac{a(1-r^{n+1})}{1-r}
\]

Adding functionality

- `\usepackage{ packagename }`
  - A library that adds or modifies the commands available
  - Thousands of packages available
  - Some are very useful

- Add the `\usepackage` command to the preamble

\[
\text{\documentclass[a4paper]{article}}
\text{\usepackage[graphicx}
\text{\begin{document}}
\text{\includegraphics[width=10cm]{Example.png}}
\text{\end{center}}
\text{\end{document}}
\]

Exercise

- The sum of a geometric series is:
\[
\sum_{k=0}^{n} ar^k = ar^0 + ar^1 + ar^2 + ar^3 + \ldots + ar^n
\]

We can rearrange the equation to produce the simple formula:
\[
\sum_{k=0}^{n} ar^k = \frac{a(1-r^{n+1})}{1-r}
\]

graphicx

- Package that allows you to import graphics
  - Graphics must be in .eps format (latex compiler) or .jpg/.png (pdflatex compiler)
  - Can set width and height
  - Other options are also available

- `\includegraphics[options]{Example.png}`

\[
\text{\documentclass[a4paper]{article}}
\text{\usepackage[graphicx}
\text{\begin{document}}
\text{\includegraphics[width=10cm]{Example.png}}
\text{\end{center}}
\text{\end{document}}
\]
Summary

- **LaTeX is a very good typesetting package**
  - Excellent for mathematics
  - Excellent for long documents
  - Excellent for people who really care about presentation
  - Very configurable
  - Steep learning curve (but worth it for those that bother)

- **Recommended software for use on Windows**
  - MikTeX (LaTeX distribution)
  - TeXWorks (text editor with built in LaTeX compiler)