**Revision**

- **LaTeX** is a document preparation system
  - Typesets documents

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

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

```
\documentclass[a4paper]{book}
\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}

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**Exercise**

Using the normal forms for setting font styles, what commands would you use to make the text "Hello" appear sans-serif, bold and italic?

```
\textsf{\textbf{\textit{Hello}}}
```
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)

Example

\begin{itshape}
This text is also italic
\end{itshape}

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

\begin{bfseries}
Hello
\end{bfseries}

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>\huge</td>
<td>sample text</td>
</tr>
</tbody>
</table>
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:
  \{\textcommand ... text goes here ... \}

Example

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

Aligning paragraphs

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

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

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

\begin{center}
furuike ya\\
kawazu tobikomu\\
mizu no oto
\end{center}

Unordered Lists

- Unordered Lists
  - List that uses bullet points
  - \texttt{itemize} environment
  - \texttt{\item} used to identify each item in the list

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

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] Fruit
\item[Apples] More fruit
\item[Bananas] Still more fruit
\end{description}
```

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.

```
\begin{quote}
They underestimated me.
Our nation must come together to unite
After all, Europe is America’s closest ally
\end{quote}
```

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

```
\begin{quotation}
They underestimated me.
Our nation must come together to unite
After all, Europe is America’s closest ally
\end{quotation}
```

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 \ for a line break. Use \section{name} to create a new section.
\end{verbatim}
```

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```
Use \ for a line break. Use \section{name} to create a new section.
```
Mathematics

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

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\textsuperscript{th} \rightarrow n^{th}

• Subscripts
  – Underscore (_)
  – Example: s_0

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: $x = y$

is a simple equation.

The equation: $x = y$

is a simple equation.

The equation: \begin{equation} x = y \end{equation}

is a simple equation.

The equation: $x = y$ \textsuperscript{(1.1)}

Other common functions

• Square roots
  – \sqrt{ ... }
  – Example: \sqrt{ x^2 + y^2 }

• Fractions
  – \frac{ numerator }{ denominator }
  – Example: \frac{ 3 }{ 2 }

• Sum
  – \sum
  – Example: \sum_{k=1}^{n} k
Example

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

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Example

If a quadratic equation is given by:
\[
\begin{align*}
 f(x) &= ax^2 + bx + c \\
\end{align*}
\]

Then the formula for calculating the roots of a quadratic equation is:
\[
\begin{align*}
 x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
\end{align*}
\]

Exercise

- Write the code that reproduces the following LaTeX:

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

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

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

- Add the \texttt{\texttt{usepackage}} command to the preamble

\[
\begin{align*}
 &\texttt{\texttt{documentclass[a4paper]{article}}} \\
 &\texttt{\texttt{usepackage{graphicx}}} \\
 &\texttt{\texttt{begin{document}}} \\
 &\ldots \\
 &\texttt{\texttt{end{document}}} \\
\end{align*}
\]
**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}`

```latex
\documentclass[a4paper]{article}
\usepackage{graphicx}
\begin{document}
This is a simple picture
\begin{center}
\includegraphics[width=10cm]{Example.png}
\end{center}
\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)
  - TeXnicCenter (An IDE for using LaTeX easily)