COMPSCI 111 / 111G

Mastering Cyberspace:
An introduction to practical computing

LaTeX

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 }**

- **\textrm{ Argument will be serif (roman) }**

- **\texttt{ Argument will be monospace }**

- **\textsc{ Argument will be small capitals }**

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?

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

```
%Normal way to set italics
\textit{This text will be italic}

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

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

Exercises

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

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

Font Size

Command	Output
`\tiny`	sample text
`\scriptsize`	sample text
`\footnotesize`	sample text
`\small`	sample text
`\normalsize`	sample text
`\large`	sample text
`\Large`	sample text
`\LARGE`	sample text
`\huge`	sample text
`\Huge`	sample text

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 ... }`

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.
}
```

Aligning paragraphs

- **`flushleft`**
  - Environment that aligns a paragraph to the left

- **`flushright`**
  - Environment that aligns a paragraph to the right

- **`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}
```

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.

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

```
\begin{quote}
They misunderestimated me.

Our nation must come together to unite

After all, Europe is America's closest ally
\end{quote}
```

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}
```

The following commands are used in LaTeX

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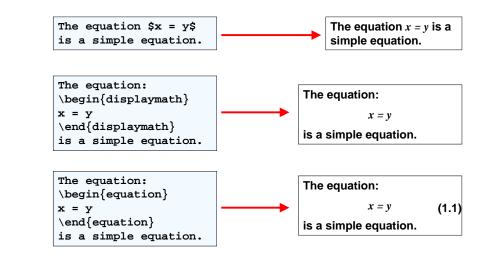
Mathematics

- **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 $x = y$ is a simple equation.

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

$$x = y \qquad (1.1)$$

is a simple equation.

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^{th}` → n^{th}

- **Subscripts**
  - Underscore (_)
  - Example: `s_0` → s_0

Other common functions

- **Square roots**
  - `\sqrt{ ... }`
  - Example: `\sqrt{ x^2 + y^2 }` $\sqrt{x^2 + y^2}$

- **Fractions**
  - `\frac{ numerator } { denominator }`
  - Example: `3\frac{ 1 }{ 2 }` $3\frac{1}{2}$

- **Sum**
  - `\sum`
  - Example: `\sum_{k=1}^{n} k` $\sum_{k=1}^{n} k$

Example

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

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

Example

```
If a quadratic equation is given by:
\begin{displaymath}
f(x) = ax^2 + bx + c
\end{displaymath}
Then the formula for calculating the roots of a
quadratic equation is:
\begin{displaymath}
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\end{displaymath}
```

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**

```
\documentclass[a4paper]{article}
\usepackage{graphicx}

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

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}**

```
\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)