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

What is the output of the following LaTeX code?

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

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
```

Exercise

What would the output of the following code be?

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

jumps over \bfseries the lazy dog
```

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:

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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:

$$\sum_{k=0}^{n} ar^k = \frac{a(1 - r^{n+1})}{1 - r}$$

Exercise

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)
    - TeXWorks (text editor with built in LaTeX compiler)