# 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 `}`**



# 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



# Font Size

**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 too

**Format:**

```
{\command ... text goes here ... }
```

```
\tiny       \scriptsize     \footnotesize
\small      \normalsize     \large
\Large      \LARGE          \huge
\Huge
```



# 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
- Can set width and height
- Other options are also available

**`\includegraphics[options]{Filename.eps}`**

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

\begin{document}
This is a simple picture

\begin{center}
\includegraphics{width=10cm]{Example.eps}
\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)