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}`

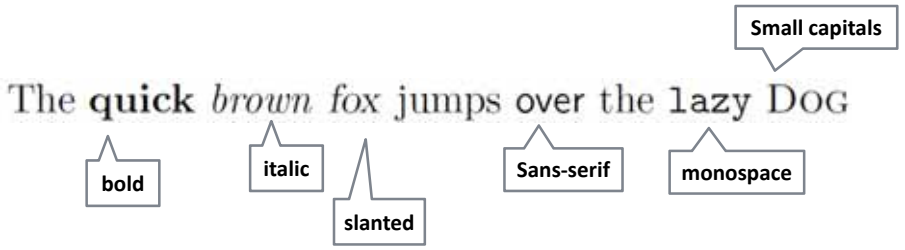
```
\documentclass[a4paper]{book}

\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 1

What is the LaTeX code that would generate the following?



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)

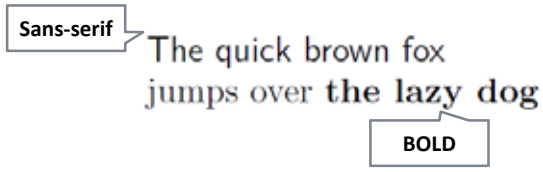
Example

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

This text is normal.

%Environment form
\begin{itshape}
This text is also italic. It can be very long.

Next, this text is still also italic
\end{itshape}

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

This text will be italic
This text is normal.
This text is also italic. It can be very long.
Next, this text is still also italic
All text from this point forward will be italic

Exercise 2

What is the LaTeX code that would generate the following?



How many different ways can you do but with the same output?

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

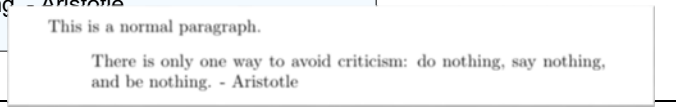
```
{\small This text is small}

{\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.
}
```

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

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

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{flushright}
Three things are certain:\\
Death, taxes, and lost data.\\
Guess which has occurred!
\end{flushright}
```


Unordered Lists

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

05.tex

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

Pears Fruit

Apples More fruit

Bananas Still more fruit

Exercise 3

- **What is the LaTeX code that would generate the following?**

- First level, itemize, first item
  - Second level, itemize, first item
  - Second level, itemize, second item
    1. Third level, enumerate, first item
    2. Third level, enumerate, second item
- First level, itemize, second item

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

06.tex

```
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

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

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

Exercise 4

- **What is the LaTeX code that would generate the following?**

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 5

- **What is the LaTeX code that would generate the following?**

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**
  - 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}
```

07.tex

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)