



MPSCI 111/111G SS 2020

**L<sup>A</sup>T<sub>E</sub>X**

# 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 }`
-

# `\emph` versus `\textit`

---

`\emph{I want to \emph{emphasize this}}`

*I want to emphasize this*

`\textit{I want to \textit{emphasize this}}`

*I want to emphasize this*

---

# 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}
```

The **quick** *brown fox* jumps over the lazy **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
```

*This text will be italic*

*This text is also italic*

*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
```

The quick brown fox  
jumps over **the lazy dog**

---



# Font Size

Command	Output
<code>\tiny</code>	sample text
<code>\scriptsize</code>	sample text
<code>\footnotesize</code>	sample text
<code>\small</code>	sample text
<code>\normalsize</code>	sample text
<code>\large</code>	sample text
<code>\Large</code>	sample text
<code>\LARGE</code>	sample text
<code>\huge</code>	sample text
<code>\Huge</code>	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.  
}
```

This text is small

***This text is large and italic***

*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{flushleft}
furuike ya\\
kawazu tobikomu\\
mizu no oto
\end{flushleft}
```

```
\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}
```

- 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
```

# 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 quote by Aristotle:

```
\begin{quote}
```

There is only one way to avoid criticism: do nothing, say nothing, and be nothing. - Aristotle

There is only one way to avoid criticism: do nothing, say nothing, and be nothing. - Aristotle

```
\end{quote}
```



# Quote versus Quotation Example

---

This is a quote by Aristotle:

There is only one way to avoid criticism: do nothing, say nothing, and be nothing. - Aristotle

There is only one way to avoid criticism: do nothing, say nothing, and be nothing. - Aristotle

This is a quote by Aristotle:

There is only one way to avoid criticism: do nothing, say nothing, and be nothing. – Aristotle

There is only one way to avoid criticism: do nothing, say nothing, and be nothing. - Aristotle

---

# 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**
    - $\$ \dots \$$
  - **`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:  
$$x = y$$
is a simple equation.



The equation:  
$$x = y$$
is a simple equation.

The equation:  
$$x = y$$
is a simple equation.



The equation:  
$$x = y \tag{1.1}$$
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:  $s_{\theta}$

  $s_{\theta}$

---

# 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

If a quadratic equation is given by:

$$\begin{aligned} &\backslash\text{begin}\{\text{displaymath}\} \\ &f(x) = ax^2 + bx + c \\ &\backslash\text{end}\{\text{displaymath}\} \end{aligned}$$

Then the formula for calculating the roots of a quadratic equation is:

$$\begin{aligned} &\backslash\text{begin}\{\text{displaymath}\} \\ &x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &\backslash\text{end}\{\text{displaymath}\} \end{aligned}$$

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:

$$\sum_{k=0}^n ar^k = ar^0 + ar^1 + ar^2 + ar^3 + \dots + ar^n$$

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

- Write the code that reproduces the following LaTeX:

The sum of a geometric series is:

$$\sum_{k=0}^n ar^k = ar^0 + ar^1 + ar^2 + ar^3 + \dots + ar^n$$

We can rearrange the equation to produce the simple formula:

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

The sum of a geometric series is:

```
\begin{displaymath}
\sum_{k=0}^n ar^k = ar^0 + ar^1 + ar^2 + ar^3 + \dots + ar^n
\end{displaymath}
```

We can rearrange the equation to produce the simple formula:

```
\begin{displaymath}
\sum_{k=0}^n ar^k = \frac{a(1 - r^{n+1})}{1 - r}
\end{displaymath}
```

# 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)