

# COMPSCI 111 / 111G

*Mastering Cyberspace:  
An introduction to practical computing*

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

# Revision

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- **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

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- `\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}
```

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

---

# Font Style

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- **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

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```
%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
```

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

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# Font Size

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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

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- **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

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- **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 tobikom\\
mizu no oto
\end{center}
```

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

---

# Unordered Lists

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- **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

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- **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

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- **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}
```

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

```
\end{quote}
```

---

# Verbatim

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- **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

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- **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

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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:  
$$x = y \quad (1.1)$$
  
is a simple equation.

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# Laying out mathematics

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- **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:  $n^{\text{th}}$    $n^{\text{th}}$

- **Subscripts**

- Underscore (\_)
  - Example:  $s_0$    $s_0$
-

# Other common functions

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- **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

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

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

---

# 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

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- 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

---

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

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- `\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}
```

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# Summary

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- **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)
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