Presentations in LaTeX

LaTeX is not limited to producing scientific papers, reports, articles or theses. It can also be used for many other types of documents, including presentations.

In fact, all the presentations and handouts used in this course have been written in LaTeX.

The beamer Document Class

To create presentations in LaTeX, we use the beamer document class. It makes creating presentations relatively simple, but is sufficiently advanced to be able to manage quite complex tasks if we desire.

A simple example:

```
\documentclass{beamer}
\usetheme{default}
\begin{document}

    \begin{frame}
        \frametitle{A Slide}
        Hello World!
    \end{frame}

\end{document}
```

A Simple Example

The sample code on the previous slide results in the presentation slide below:

Frames & Slides

What we normally call 'slides' in presentations, `beamer` refers to as `frames`. The `frame` environment is used to define each slide in our presentation; the content for our slides is written within this environment.

```
\begin{frame}
    \frametitle{A Slide}
    Hello World!
\end{frame}
```

We can include as many slides as we desire by repeating the `frame` environment for each slide.

Frame Shortand

Rather than typing `\begin{frame} ...\begin{frame}` for each slide, we can use the shortcut `\frame{ ...}`

So:

```
\begin{frame}
    \frametitle{A Slide}
    Hello World!
\end{frame}
```

and:

```
\frame{
    \frametitle{A Slide}
    Hello World!
}
```

are the same thing.

Frame Titles

beamer allows us to specify the title of a slide in two different ways:

1. Using the \frametitle command as in our previous example
2. By specifying the title as an argument on the frame environment:

```
\begin{frame}{A Slide}
    Hello World!
\end{frame}
```

Either way is fine. The first method is the older method and the second is only supported in newer versions of beamer. If you are using \frame{...} you will need to use the first method.

Metadata

We specify author, title and date information in the preamble of the document.

```
\title[optional short title]{Title of Presentation}
\subtitle{An optional extra subtitle}
\author[optional short author name]{Author name}
\institute[optional short name]{Institute name}
\date[short date]{Date information}
```

The optional short version of the title, author and date information is included for display on slide footers etc.

Title Page

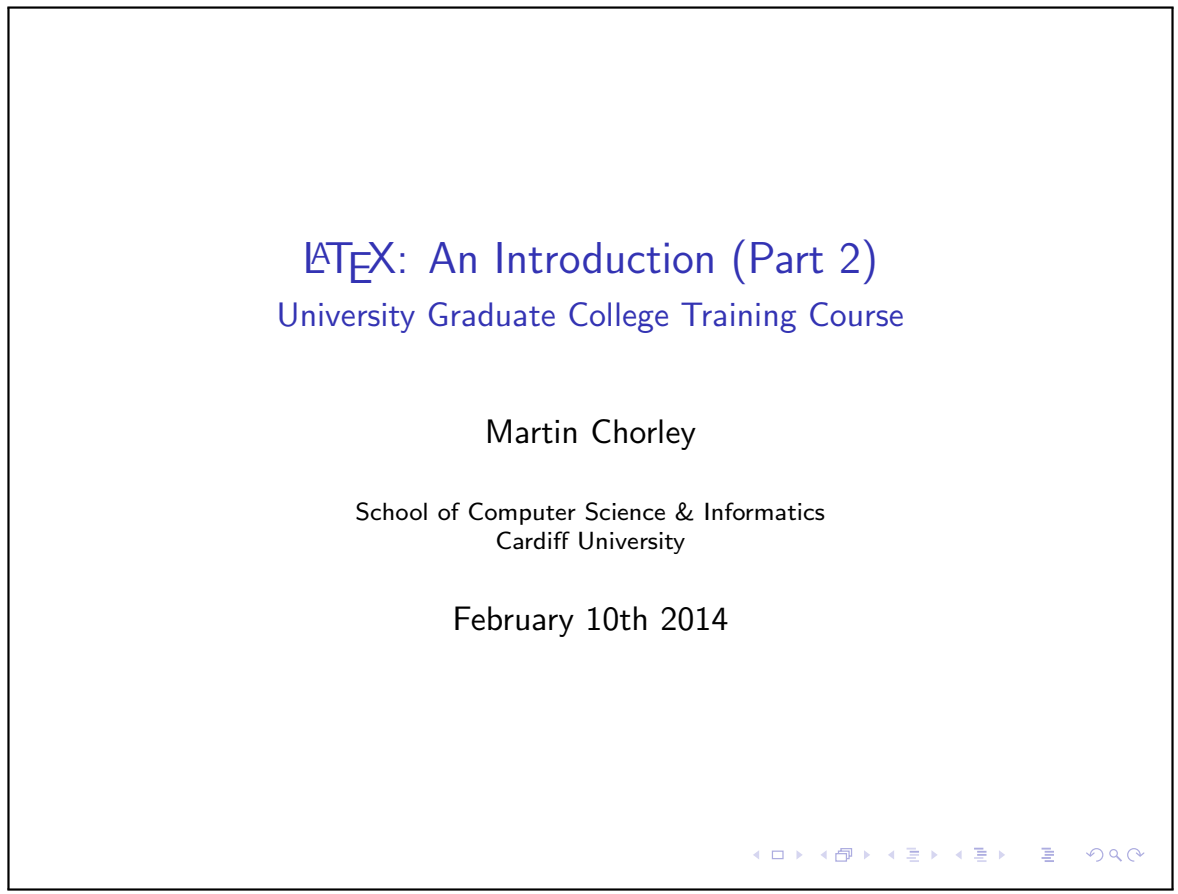
Once we have specified the document metadata, we can use the \titlepage command to insert a title page into our presentation

```
\title[\LaTeX]{\LaTeX\ for Beginners}
\subtitle{University Graduate College Training
Course}
\author[MJC]{Martin Chorley}
\institute[COMSC]{School of Computer Science \&
Informatics \\ Cardiff University}
\date[Feb 2013]{February 1st 2013}

\begin{frame}{}
    \titlepage
\end{frame}
```

Title Page Example

The sample code on the previous slide results in the presentation slide below:



Themes

beamer allows us to change the appearance of our slides by using themes.

```
\documentclass{beamer}
\usetheme{default}
```

Some of the available themes are:

Antibes	Boadilla	Berkeley	Berlin	Copenhagen
Darmstadt	Dresden	Frankfurt	Goettingen	Hannover
Ilmenau	JuanLesPins	Luebeck	Madrid	Malmoe
Marburg	Montpellier	PaloAlto	Pittsburgh	Rochester
Singapore	Szeged	Warsaw	boxes	default

default Theme

A sample slide

Theorem (The Poincaré inequality)

Suppose $\Omega \in \mathbf{R}^n$ is a bounded domain with smooth boundary. Then there exists a $\lambda > 0$, depending only on Ω, such that for any function f in the Sobolev space $H_0^1(\Omega)$ we have:

$$\int_\Omega |\nabla u|^2 \, dx \geq \lambda \int_\Omega |u|^2 \, dx.$$

Here is what *itemized* and *enumerated* lists look like:

- itemized item 1
- itemized item 2
- itemized item 3

1. enumerated item 1
2. enumerated item 2
3. enumerated item 3

Berkeley Theme

A sample slide

Theorem (The Poincaré inequality)

Suppose $\Omega \in \mathbf{R}^n$ is a bounded domain with smooth boundary. Then there exists a $\lambda > 0$, depending only on Ω, such that for any function f in the Sobolev space $H_0^1(\Omega)$ we have:

$$\int_\Omega |\nabla u|^2 \, dx \geq \lambda \int_\Omega |u|^2 \, dx.$$

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1. enumerated item 1
2. enumerated item 2
3. enumerated item 3

Boadilla Theme

A sample slide

Theorem (The Poincaré inequality)

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- itemized item 1
- itemized item 2
- itemized item 3

1. enumerated item 1
2. enumerated item 2
3. enumerated item 3

Customising Themes

We can customise `beamer` themes in many ways.

Changing the `outertheme` with the `\useoutertheme{...}` command will change the header and footer of each slide. Available outer themes include:

infolines	miniframes	shadow	sidebar
smoothbars	smoothtree	split	tree

Changing the `innertheme` with the `\useinnertheme{...}` command will change the inner elements (bullets, boxes) of each slide. Available inner themes include:

rectangles	circles	inmargin	rounded

Customising Themes

We can set the colour of elements on slides individually:

```
\setbeamercolor{frametitle}{fg=red}
```

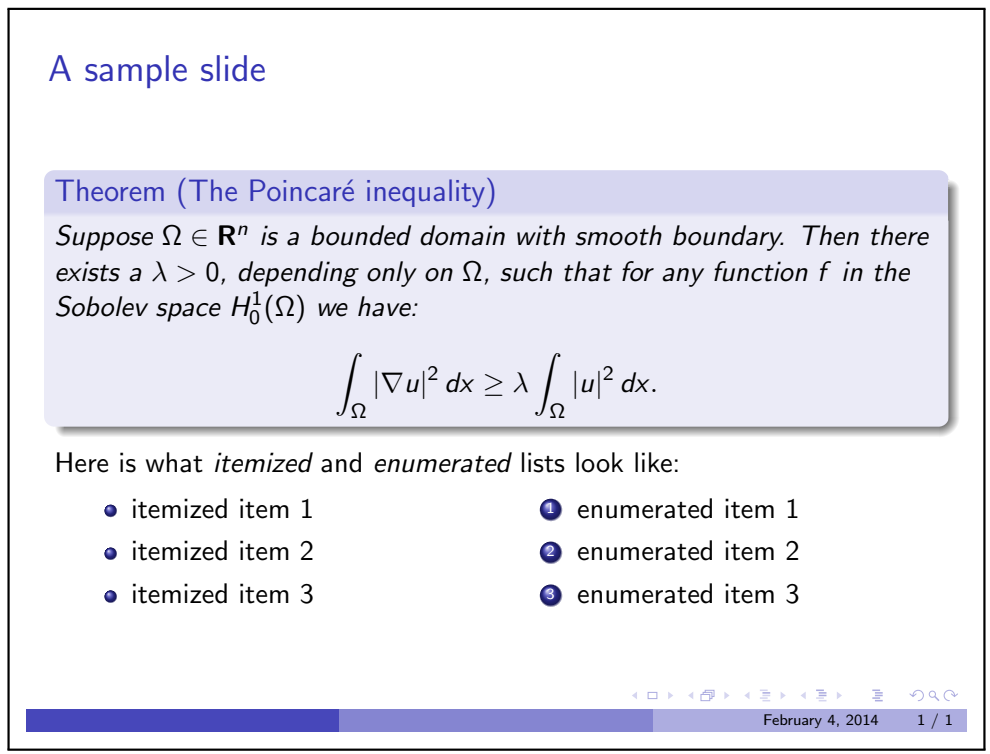
Similarly, we can change the font of particular elements:

```
\setbeamerfont{title}{family=\rm}
```

Alternatively we can customise the colour and fonts of `beamer` themes using the `\usefonttheme{...}` command and the `\usecolortheme{...}` command.

Customising Themes - Colour

Recall the `Boadilla` theme?:



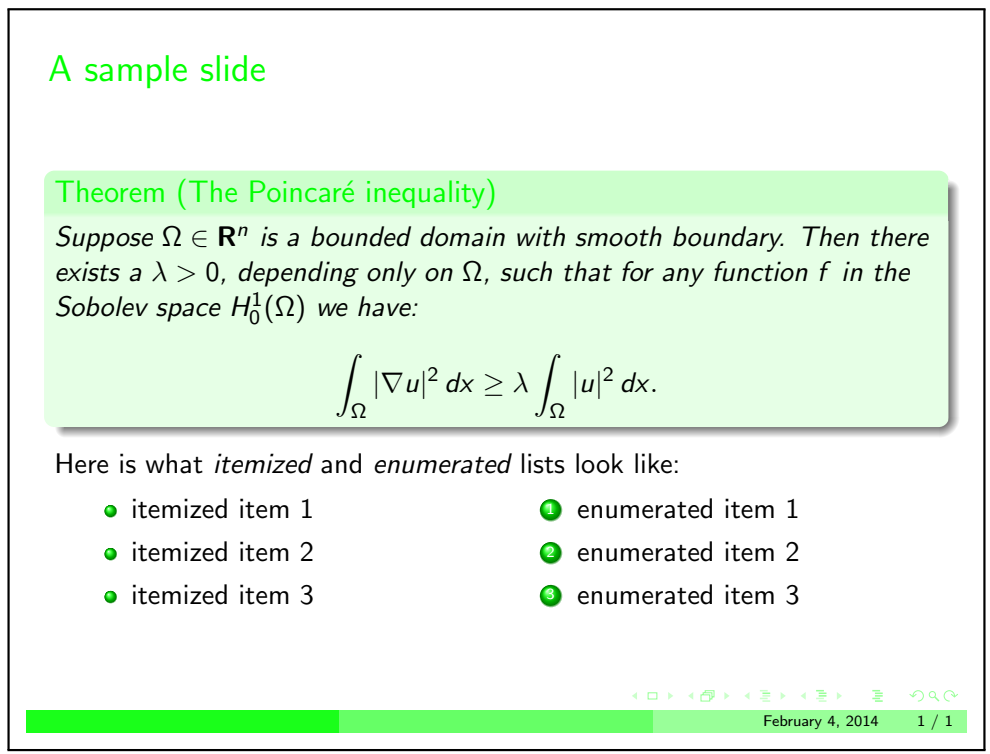
The slide element structure is based around the colour blue. We can change this with the `\usecolortheme{...}` command

Customising Themes - Colour

If we change the theme to red:

```
\usecolortheme[named=green]{structure}
```

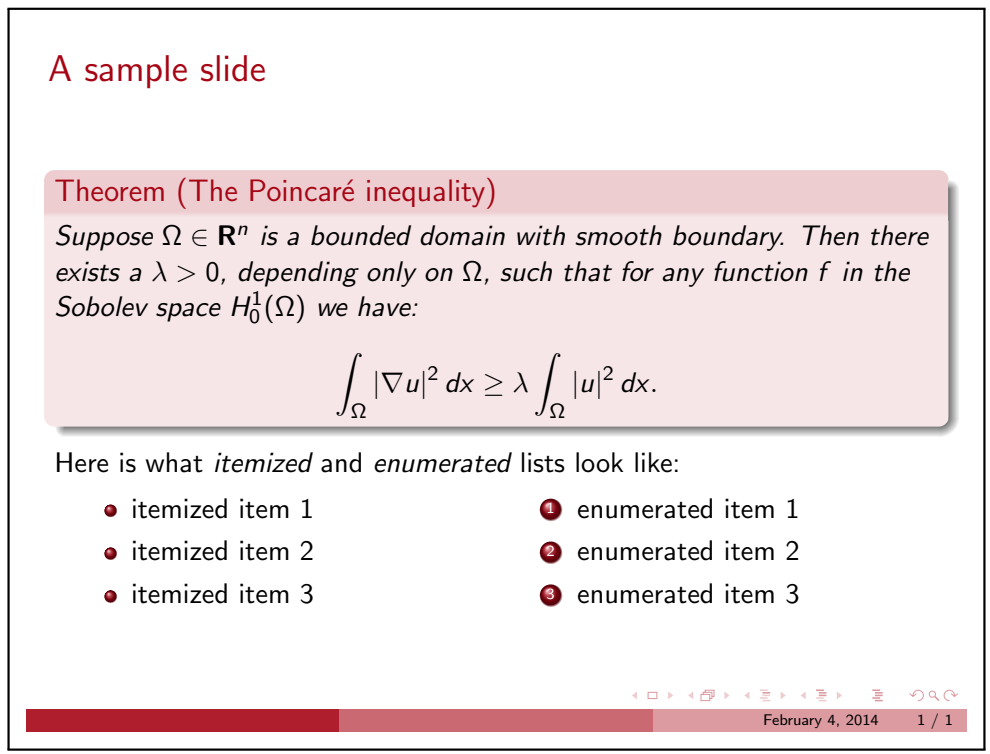
The structure elements of the slide change to the colour specified:



Customising Themes - Colour

We can even specify our own colours. So, to match the Cardiff University official colour:

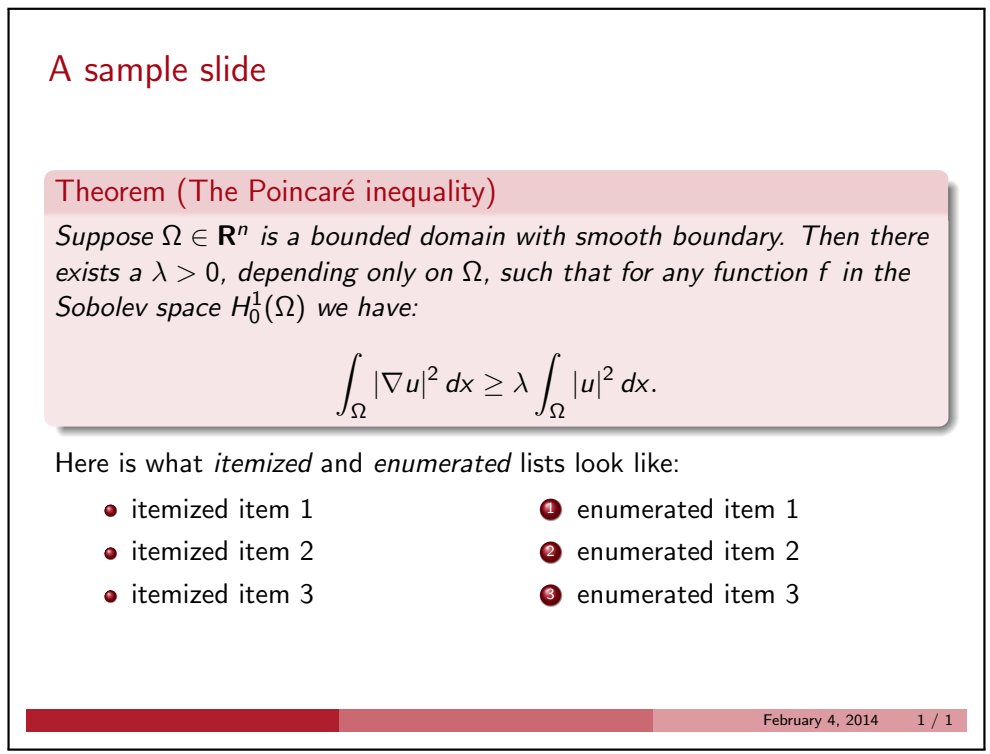
```
\usecolortheme[RGB={166,5,20}]{structure}
```



Customising Slides - Removing Navigation

`beamer` includes navigation items on slide output for moving through the presentation. These are usually unnecessary and can be removed:

```
\setbeamertemplate{navigation symbols}{}
```



Customising Slides - Adding a footer

Some themes come with a footer already included, some do not. Using the `\useoutertheme{infolines}` command will add a footer to any theme that does not have one.

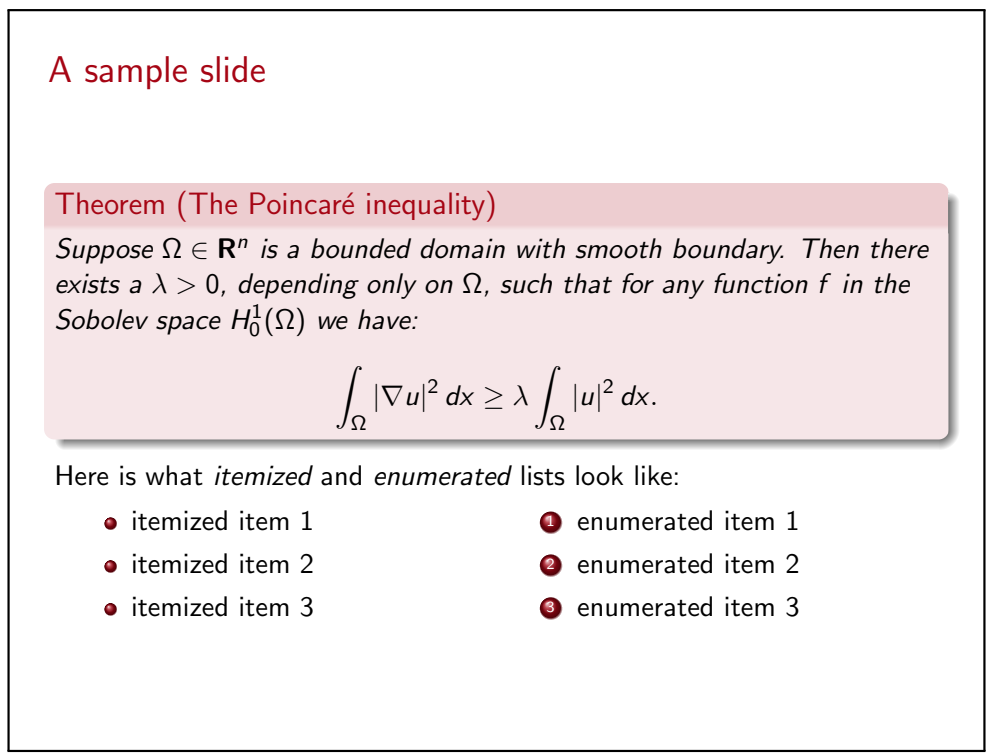
```
\documentclass{beamer}
\usecolortheme[named=red]{structure}
\useoutertheme{infolines}
\usetheme{Rochester}
```

This command must come *before* the command to set the theme.

Removing Decoration

If you have a lot of information or a large picture to display on a slide and want to remove the decoration, add the `[plain]` option to the frame environment:

```
\begin{frame}[plain]
...
```



Columns

It is possible to split slides into columns

```
\begin{frame}{Columns}
    Here's a line that goes all the way across the
    slide, it will be followed by two columns
    \begin{columns}
        \begin{column}{0.3\textwidth}
            Here's a column that takes up 30 percent
            of the width of the slide
        \end{column}
        \begin{column}{0.5\textwidth}
            Here's a column that takes up 50 percent
            of the width of the slide
        \end{column}
    \end{columns}
    Finally here's a line that goes all the way across
     the slide again.
```

Columns Example

Columns

Here's a line that goes all the way across the slide, it will be followed by two columns

Here's a column that takes up 30 percent of the width of the slide

Here's a column that takes up 50 percent of the width of the slide

Finally here's a line that goes all the way across the slide again.

Blocks

It is possible to put text in blocks within slides, these can be titled or optionally can have a blank title

```
\begin{frame}{Blocks}
\begin{block}{A Block}
    Here's a block of text in a marked block with a
    title
\end{block}
\begin{block}{}
    Here's a block of text in a marked block with an
    empty title
\end{block}
\begin{alertblock}{an Alert block}
    This is a block of text in an alert block
\end{alertblock}
\begin{exampleblock}{an Example block}
    This is a block of text in an example block
\end{exampleblock}
```

Blocks Example

Blocks

A Block

Here's a block of text in a marked block with a title

Here's a block of text in a marked block with an empty title

an Alert block

This is a block of text in an alert block

an Example block

This is a block of text in an example block

Animation

beamer is capable of adding animation to slides. The \pause command causes beamer to output slides at different stages of construction, so that items appear as we advance through the slides.

```
\begin{frame}[plain]
This sentence will appear first \\
\pause
Then this sentence \\
\pause
Finally this sentence \\
```

This sentence will appear first

Then this sentence

Finally this sentence

This sentence will appear first
Then this sentence
Finally this sentence

This sentence will appear first
Then this sentence
Finally this sentence

Animation

A shorthand for pause when using the \itemize environment is to use\itemize[<+->]. This effectively acts as a \pause command before each item in the list:

```
\begin{itemize}[<+->]
\item The first item
\item The second item
\item The third item
\end{itemize}
```

- The first item
- The second item
- The third item

- The first item
- The second item
- The third item

- The first item
- The second item
- The third item

Complex Animation

A fine grained control of the order and duration of items being visible can be had with many environments and commands by specifying on which slides an item should appear.

```
\begin{itemize}
\item<1-> This item will appear from the first slide
onwards
\item<2-> This item will appear from the second slide
onwards
\item<3-> This item will appear from the third slide
onwards
\item<2-3> This item will appear on the second slide
until the third
\item<4-> This item will appear on the fourth slide
\end{itemize}
```

- This item will appear from the first slide onwards
- This item will appear from the second slide onwards
- This item will appear from the third slide onwards
- This item will appear on the second slide until the third
- This item will appear on the fourth slide

- This item will appear from the first slide onwards
- This item will appear from the second slide onwards
- This item will appear from the third slide onwards
- This item will appear on the second slide until the third
- This item will appear on the fourth slide

- This item will appear from the first slide onwards
- This item will appear from the second slide onwards
- This item will appear from the third slide onwards
- This item will appear on the second slide until the third
- This item will appear on the fourth slide

- This item will appear from the first slide onwards
- This item will appear from the second slide onwards
- This item will appear from the third slide onwards
- This item will appear on the second slide until the third
- This item will appear on the fourth slide

Animation

There are also commands for controlling on which slides text appears: the `\only<n-m>` command and `\uncover<n-m>` commands.

The `\only<n-m>` command will only insert text on the specified slides.

The `\uncover<n-m>` command will insert text on all slides, but only 'uncover' it on the specified slides. The rest of the time it will be covered according to the setting of `\setbeamercovered`.

\uncover

The \uncover<n-m> command will insert text on all slides, but only 'uncover' it on the specified slides. The rest of the time it will be covered according to the setting of \setbeamercovered (which could be transparent for example).

```
\uncover<1->{This text is visible from slide 1 onwards
 \\}
\uncover<2-3>{This text is visible from slide 2 to
slide 3 \\}
\uncover<3>{This text is visible on slide 3 \\}
\uncover<4->{This text is visible from slide 4 onwards
}
```

This text is visible from slide 1 onwards

This text is visible from slide 2 to slide 3

This text is visible on slide 3

This text is visible from slide 4 onwards

This text is visible from slide 1 onwards

This text is visible from slide 2 to slide 3

This text is visible on slide 3

This text is visible from slide 4 onwards

This text is visible from slide 1 onwards
This text is visible from slide 2 to slide 3
This text is visible on slide 3
This text is visible from slide 4 onwards

This text is visible from slide 1 onwards

This text is visible from slide 2 to slide 3

This text is visible on slide 3

This text is visible from slide 4 onwards

\only

The \only<n-m> command will only insert text on the specified slides. At all other times, the text will not be rendered.

```
\only<1->{This text is visible from slide 1 onwards
\\}
\only<2-3>{This text is visible from slide 2 to slide
3 \\}
\only<3>{This text is visible on slide 3 \\}
\only<4->{This text is visible from slide 4 onwards}
```

This text is visible from slide 1 onwards

This text is visible from slide 1 onwards
This text is visible from slide 2 to slide 3

This text is visible from slide 1 onwards
This text is visible from slide 2 to slide 3
This text is visible on slide 3

This text is visible from slide 1 onwards
This text is visible from slide 4 onwards

Handouts

We have seen that beamer creates animation by creating duplicate slides with intermediate steps displayed.

These intermediate slides are not necessary when creating handouts to give to the audience.

Setting beamer to 'handout' mode will suppress this extra slide creation, and create slides with all steps of the animation on them.

```
\documentclass[handout]{beamer}
```

Exercise 5

Use the `beamer` document class to create a presentation