GSNS workshop: LaTeX beginners

TeXniCie
Presenters: Thomas & Jesse

4 September 2024

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Schedule

- Text document
- ⟨Exercises⟩
- Formulas
- Figures
- ⟨Exercises⟩
- Lists and Tables
- Finishing notes

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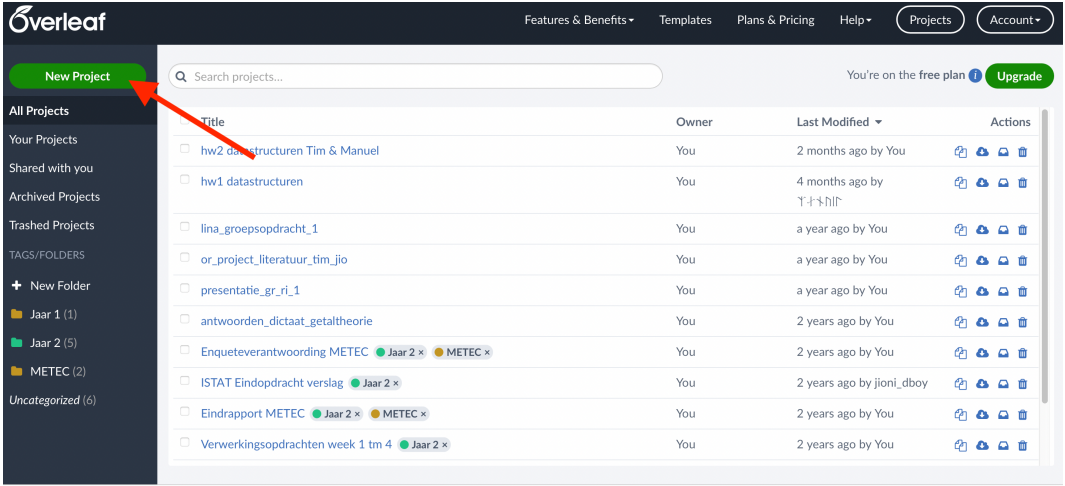
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Features & Benefits
Templates
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New Project
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TAGS/FOLDERS
New Folder
Jaar 1 (1)
Jaar 2 (5)
METEC (2)
Uncategorized (6)
Title
Owner
Last Modified
Actions
hw2 datastructuren Tim & Manuel
You
2 months ago by You
hw1 datastructuren
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4 months ago by
lina_groepsopdracht_1
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or_project_literatuur_tim_jio
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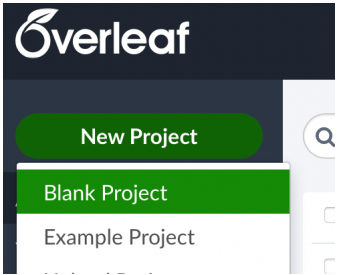
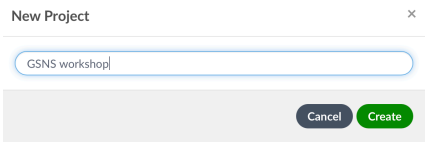

Overleaf
New Project
Blank Project
Example Project


New Project
GSNS workshop
Cancel
Create

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Example project}
\author{Vincent Kuhlmann}
\date{February 2023}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Command syntax:

```
\xxx{argument1}{argument2}
\xxx[optional argument]{argument1}{argument2}
```

Example:

```
\section{Introduction}
```

1) **Backslash:** we are starting a command
2) **Command name:** 'section', place a header in the document. Takes 1 argument.
3) **Argument 1:** the name of the section

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{Example project}
\author{Vincent Kuhlmann}
\date{February 2023}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Environment syntax:

```
\begin{xxx}
    ...
\end{xxx}
```

Example:

```
\begin{center}
```

1) **Begin:** We are starting the center environment
2) **Body:** The text to be centered on the page
3) **End:** Now go back to normal

```
\documentclass{article}
\usepackage{graphicx}

\title{Example project}
\author{Vincent Kuhlmann}
\date{September 2023}

\begin{document}

\maketitle

\section{Introduction}

\end{document}
```

Document structure:

- Preamble.
  This is where configuration goes.
  - `\documentclass`: specify a template.
  - `\usepackage{xxx}`: import package 'xxx'.
  - Other: a.o. setting the title of your document
- Document body.
  This is where the text and other content go.

What are packages?

LaTeX-code written by other people. They can add new commands, change how your document looks, or improve existing functionalities.

Example: package 'xcolor' provides the command `\textcolor{red}{some text}`.

Syntax: `\usepackage[aa=6cm,bb,cc=red]{xxx}`

Imports package 'xxx'. The optional argument is a list of instructions.

Most essential packages

- **Math packages: amsmath, amssymb**
  Defines `\begin{pmatrix}`-environment, which is a matrix with parentheses.
- **Layout packages: geometry**

```
\usepackage[a4paper,margin=2.54cm]{geometry}
```

- **Other**: **graphicx**, **babel**
  Graphicx fixes and improves use of images, Babel translates default terms, e.g. 'Inhoudsopgave' instead of 'Contents'.

Available packages are managed by CTAN. On their website you find package manuals.

Exercises and examples from this presentation will not work if you forget required packages. For a good starting point, see `https://vkuhlmann.com/latex/example`.

Syntax for text?

```
\begin{document}

This is some text, very \textbf{meaningful} text.
On a new line? And I want     spaces,    lots of

This is some text, very \textbf{meaningful} text.
\end{document}
```

What does this look like in the output?

Syntax for text?

The fix:

```
...
\usepackage{parskip}

\begin{document}

This is some text, very \textbf{meaningful} text.
On a new line? And I want\ \ \ \ \ spaces,
\hspace{1cm}lots of spaces.

This is some text, very \textbf{meaningful} text.
\end{document}
```

Special characters

Code	Result	Code	Result
\{	{	{	Begin group
\}	}	}	End group
\%	%	%	Comment
_	_	_	Used in maths
\textasciicircum	^	^	Used in maths
\$	$	$	Math mode
\textbackslash	\	\	Command
\&	&	&	Column separation
\#	#	#	Parameter
\textgreater	>	>	>
\textless	<	<	<

Quotes

```
'LaTeX' : 'LaTeX'
`LaTeX' : ‘LaTeX’
``LaTeX'': “LaTeX”
```

More with text – Text effects

Result	Code	Result	Code
Text	`\textbf{Text}`	Text	`\texttt{Text}`
Text	`\textit{Text}`	Text	`{\tiny Text}`
TEXT	`\textsc{Text}`	Text	`{\LARGE Text}`
Text	`\underline{Text}`	Text	`\textcolor{red}{Text}` [1]

Huge, huge, LARGE, Large, large, normalsize, small, footnotesize, scriptsize, tiny

[1] `\usepackage{xcolor}`

More with text – Lists

```
These are the ingredients:
\begin{itemize}
    \item Carrots
    \begin{enumerate}
        \item Buy
        \item Peel
        \item Chop
    \end{enumerate}
    \item Onions

    Lipsum dolor sit amet.
    \item Potatoes
\end{itemize}
```

These are the ingredients:

- Carrots
  1. Buy
  2. Peel
  3. Chop
- Onions

Lipsum dolor sit amet.

- Potatoes

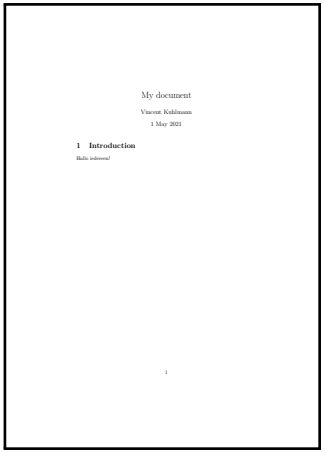
Page margins

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{My document}
\author{Vincent Kuhlmann}
\date{1 May 2021}

\begin{document}
    \maketitle
    \section{Introduction}

    Hallo iedereen!
\end{document}
```


My document

Vincent Kuhlmann

1 May 2021

1 Introduction

Hallo iedereen!

1

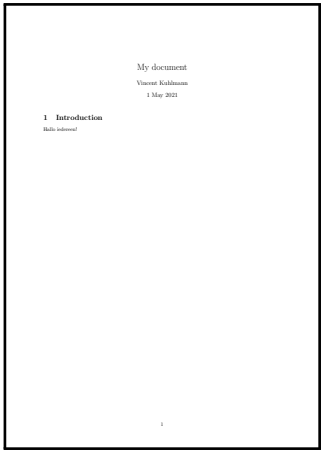
Page margins

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage[a4paper,margin=2.54cm]{geometry}

\title{My document}
\author{Vincent Kuhlmann}
\date{1 May 2021}

\begin{document}
    \maketitle
    \section{Introduction}

    Hallo iedereen!
\end{document}
```



Section commands

```
\section{AA}
Lorem ipsum dolor sit amet,
consectetur adipiscing elit.

\section{BB}
\subsection{CC}
\subsubsection{DD}
\subsection{EE}
Nullam a risus at arcu
lobortis viverra vel
volutpat diam.

\section{FF}
\subsubsection{GG}
```

1 AA

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

2 BB

2.1 CC

2.1.1 DD

2.2 EE

Nullam a risus at arcu lobortis viverra vel volutpat diam.

3 FF

3.0.1 GG

Table of contents

```
\begin{document}
    \maketitle
    \tableofcontents

    \section{AA}
    ...
\end{document}
```

Contents

1 AA

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

Table of contents

```
\begin{document}
    \maketitle
    \tableofcontents
    \newpage

    \section{AA}
    ...
\end{document}
```

Contents

Exercises!

Slides and exercises are available at
texnicie.nl

Math

There are two ways to typeset math:

inline mode

The trigonometric identity is given by $\sin^2(\theta) + \cos^2(\theta) = 1$ for all θ.

display mode

The Pythagorean trigonometric identity is given by

$$\sin^2(\theta) + \cos^2(\theta) = 1 \tag{1}$$

The identity

$$1 + tan^2(\theta) = \frac{1}{cos^2\theta} \tag{2}$$

Is also called the Pythagorean trigonometric identity.

Inline math

Text and symbols between `\(` and `\)` are treated as **math sybmols**.

```
\documentclass[a5paper]{article}
\begin{document}
The trigonometric identity is
given by \( \sin^2(\theta) + \cos^2(\theta) = 1 \). This identity is also
called the Pythagorean trigonometric identity.
\end{document}
```

The trigonometric identity is given by $\sin^2(\theta) + \cos^2(\theta) = 1$. This identity is also called the Pythagorean trigonometric identity.

Math packages

The following three packages are useful for typesetting mathematics:

```
\documentclass[a4paper, 10pt]{article}
\usepackage{amsmath}
\usepackage{amssymb}
\usepackage{amsthm}
\begin{document}
\[
    ax^2 + bx + c = 0 \qquad
    \text{the general form of the quadratic equation}
\]
\end{document}
```

These provide options for adding text to formulae, extra symbols such as $\boxplus$, $\rightsquigarrow$ and $\mathbb{R}$ and better theorem and proof environments.

Basic math

Formula	Code	Formula	Code
$\sqrt{2}$	$ $	$\sqrt[3]{8}$	$ $
$\frac{2}{3}$	$ $	x_1	$ $
$6 \geq 3$	$ $	x_1^2	$ $
$a^2 + b^2$	$ $	a^{2+b^2}	$ $

Basic math

Formula	Code	Formula	Code
$\sqrt{2}$	`$ \sqrt{2} $`	$\sqrt[3]{8}$	`$ $`
$\frac{2}{3}$	`$ $`	x_1	`$ $`
$6 \geq 3$	`$ $`	x_1^2	`$ $`
$a^2 + b^2$	`$ $`	a^{2+b^2}	`$ $`

Basic math

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$\frac{2}{3}$	`$ \frac{2}{3} $`	x_1	`$ $`
$6 \geq 3$	`$ $`	x_1^2	`$ $`
$a^2 + b^2$	`$ $`	a^{2+b^2}	`$ $`

Basic math

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$a^2 + b^2$	`$ $`	a^{2+b^2}	`$ $`

Basic math

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$\frac{2}{3}$	`$ \frac{2}{3} $`	x_1	`$ $`
$6 \geq 3$	`$ 6\geq 3 $`	x_1^2	`$ $`
$a^2 + b^2$	`$ a^2 + b^2 $`	a^{2+b^2}	`$ $`

Basic math

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$\frac{2}{3}$	`$ \frac{2}{3} $`	x_1	`$ x_1 $`
$6 \geq 3$	`$ 6\geq 3 $`	x_1^2	`$ x_1^2 $`
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Basic math

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$\sqrt{2}$	`$ \sqrt{2} $`	$\sqrt[3]{8}$	`$ \sqrt[3]{8} $`
$\frac{2}{3}$	`$ \frac{2}{3} $`	x_1	`$ x_1 $`
$6 \geq 3$	`$ 6\geq 3 $`	x_1^2	`$ $`
$a^2 + b^2$	`$ a^2 + b^2 $`	a^{2+b^2}	`$ $`

Basic math

Formula	Code	Formula	Code
$\sqrt{2}$	`$ \sqrt{2} $`	$\sqrt[3]{8}$	`$ \sqrt[3]{8} $`
$\frac{2}{3}$	`$ \frac{2}{3} $`	x_1	`$ x_1 $`
$6 \geq 3$	`$ 6\geq 3 $`	x_1^2	`$ x_1^2 $`
$a^2 + b^2$	`$ a^2 + b^2 $`	a^{2+b^2}	`$ a^{2+b^2} $`

Basic math

Formula	Code	Formula	Code
$\sqrt{2}$	`$ \sqrt{2} $`	$\sqrt[3]{8}$	`$ \sqrt[3]{8} $`
$\frac{2}{3}$	`$ \frac{2}{3} $`	x_1	`$ x_1 $`
$6 \geq 3$	`$ 6\geq 3 $`	x_1^2	`$ x_1^2 $`
$a^2 + b^2$	`$ a^2 + b^2 $`	a^{2+b^2}	`$ a^{2 + b^2} $`

Basic math

Formula	Code	Formula	Code
$\sqrt{2}$	`$ \sqrt{2} $`	$\sqrt[3]{8}$	`$ \sqrt[3]{8} $`
$\frac{2}{3}$	`$ \frac{2}{3} $`	x_1	`$ x_1 $`
$6 \geq 3$	`$ 6\geq 3 $`	x_1^2	`$ x_1^2 $`
$a^2 + b^2$	`$ a^2 + b^2 $`	a^{2+b^2}	`$ a^{2 + b^2} $`

`$ x^22 $`: x^22

Basic math

Formula	Code	Formula	Code
$\sqrt{2}$	`$ \sqrt{2} $`	$\sqrt[3]{8}$	`$ \sqrt[3]{8} $`
$\frac{2}{3}$	`$ \frac{2}{3} $`	x_1	`$ x_1 $`
$6 \geq 3$	`$ 6\geq 3 $`	x_1^2	`$ x_1^2 $`
$a^2 + b^2$	`$ a^2 + b^2 $`	a^{2+b^2}	`$ a^{2 + b^2} $`

`$ x^22 $`: x^22 | `$ x^{22}$`: x^{22}

Display math

There are many display math environments. Today we focus on the **align** environment.

```
 The double angle formula can now be rewritten as
\begin{align}
    \cos(2\theta) &=  \cos^2\theta - sin^2\theta \\
                  &= 2\cos^2\theta - 1
\end{align}
```

The double angle formula can now be rewritten as

$$\cos(2\theta) = \cos^2\theta - sin^2\theta \tag{3}$$
$$= 2\cos^2\theta - 1 \tag{4}$$

Display math

Alternative display math environments:

Environment	Use	Example
`align`	Several aligned lines (use &)	$f(x) = x^2 + 2x + 1 \quad (5)$ $= (x+1)^2. \quad (6)$
`multline`	Single equation spread over several lines	$f(x) = x^2 + 2x + 1$ $= (x+1)^2. \quad (7)$
`equation`	Single centered equation	$f(x) = x^2 + 2x + 1 = (x+1)^2. \quad (8)$
`gather`	Several centered equations	$f(x) = x^2 + 2x + 1 \quad (9)$ $= (x+1)^2. \quad (10)$

Display math

Adding a star * to a display math environment removes the equation numbers.

```
 The double angle formula can now be rewritten as
\begin{align*}
    \cos(2\theta) &=  \cos^2\theta - sin^2\theta \\
                  &= 2\cos^2\theta - 1
\end{align*}
```

The double angle formula can now be rewritten as

$$\begin{aligned}\cos(2\theta) &= \cos^2\theta - sin^2\theta \\ &= 2\cos^2\theta - 1\end{aligned}$$

`\[...\]` is a shortcut for `\begin{equation*}...\end{equation*}`.

Figure

```
Here you see a penguin:
\begin{center}
    \includegraphics[height=2cm]{penguin.jp
\end{center}
Photo by Sue Flood.
```

Here you see a penguin:

Photo by Sue Flood.

Figure

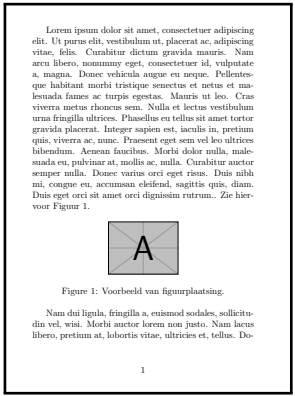
```
You can see a penguin in Figure~\ref{fig:penguin}.
\begin{figure}[h]
    \centering
    \includegraphics[height=2cm]{penguin}
    \caption{A cute penguin. Photo by Sue Flood.}
    \label{fig:penguin}
\end{figure}
```

You can see a penguin in Figure 1.

Figure 1: A cute penguin. Photo by Sue Flood.

Figure placement

```
\begin{figure}[h]
```



Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.. Zie hiervoor Figuur 1.

A

Figure 1: Voorbeeld van figuurplaatsing.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Do-

1

nec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

2

Figure placement

```
\begin{figure}[t]
```

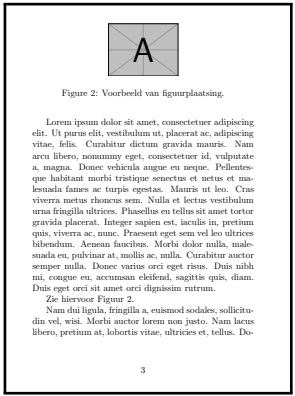
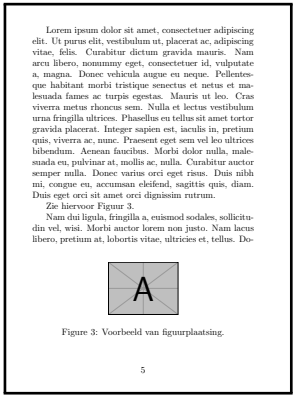


Figure placement

```
\begin{figure}[b]
```



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Zie hiervoor Figuur 3.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Do-

A

Figure 3: Voorbeeld van figuurplaatsing.

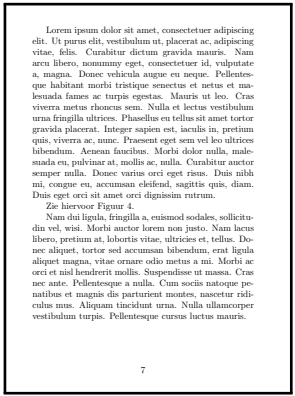
5

nec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

6

Figure placement

```
\begin{figure}[p]
```



Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Zie hiervoor Figuur 4.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

7

Figure 4: Voorbeeld van figuurplaatsing.

8

Figure placement

Specify one or more of the following characters:

- h (HERE): Figure can come here.
- t (TOP): Figure can come at the top of the page.
- b (BOTTOM): Figure can come at the bottom of the page
- p (PAGE): Figure can come on a special page for figures.
- !: Override internal parameters for floats.
- H (HERE): No floating, always here. (`\usepackage{float}`)

For example: `\begin{figure}[ht]`

When working with images: `\usepackage{graphicx}`

Dimensions

- Full linewidth

```
\includegraphics[width=\linewidth]{assets/pinguin.jpg}
```

- 90% linewidth

```
\includegraphics[width=0.9\linewidth]{assets/pinguin.jpg}
```

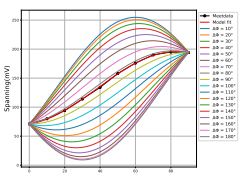
- Width maximally 90% linewidth and height maximally 5 cm

```
\includegraphics[
    width=0.9\linewidth,height=5cm,keepaspectratio
]{assets/pinguin.jpg}
```

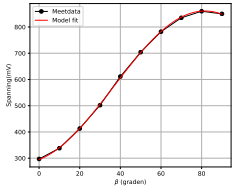
Subfigure

```
\usepackage{subcaption}
...

\begin{figure}[htbp]
    \centering
    \begin{subfigure}[b]{0.45\textwidth}
        \includegraphics[width=\textwidth]{.
        \caption{BB}
        \label{fig:dphiExample}
    \end{subfigure}\qquad
    \begin{subfigure}[b]{0.45\textwidth}
        \includegraphics[width=\textwidth]{...,
        \caption{CC}
        \label{fig:fitExample}
    \end{subfigure}
    \caption{Meerdere afbeeldingen naast elkaar!}
\end{figure}
```



(a) BB



(b) CC

Figuur 1: Multiple images next to eachother!

Exercises!

Slides and exercises are available at
texnicie.nl

Lists

There are three types of lists environments in latex.
enumerate is used for information that has order:
itemize is used for information that does not have order:
description is used for information that has descriptions for each item

Examples

Enumerated list	**Itemized list**	**Descriptive list**
Biggest cities of the Netherlands	Members of the TeXniCie	Tech companies
1) Amsterdam 2) Rotterdam 3) The Hague 4) Utrecht	▪ Jesse ▪ Thomas ▪ Vincent	**Apple** Computer company **Facebook** Social media company **Microsoft** Software company

Lists

As with any environment you start with a `\begin` command and end with an `\end` command. In front of each item use the command `\item`. In case of the descriptive environment add square braces to assign a label to each item: `\item[label]`

Examples

Itemized list

```
\begin{itemize}
\item Jesse
\item Thomas
\item Vincent
\end{itemize}
```

Enumerated list

```
\begin{enumerate}
\item Amsterdam
\item Rotterdam
\item The Hague
\item Utrecht
\end{enumerate}
```

Descriptive list

```
\begin{description}
\item[Apple] Computer company
\item[Facebook] Social media company
\item[Microsoft] Software company
\end{description}
```

Tables

Tables are made in the **tabular** environment. When making a table you start with `\begin{tabular}`. Afterwards, an extra parameter must be given that tells Latex how the table will be formatted. For example `{l l l}` tells us that we want a table with three columns that are aligned to the left.
Inside of the tabular environment a new column is made with the &-symbol and a new row with \\.

Example

Name	Population
Amsterdam	903,399
Rotterdam	655,468
The Hague	553,417

```
\begin{tabular}{l l l}
Name & Population\\
Amsterdam & 903,399\\
Rotterdam & 655,468\\
The Hague & 553,417\\
\end{tabular}
```

Tables

You have now leaned how to make a table, but it would be nice if we could have seperator lines between rows and columns. For the columns you can add a pipe symbol between columns in the paramater. For seperator lines between rows the command `\hline` is used.

Example

Name	Population
Amsterdam	903,399
Rotterdam	655,468
The Hague	553,417

```
\begin{tabular}{||l | l||}
        \hline\hline
        Name & Population\\\hline
        Amsterdam & 903,399\\\hline
        Rotterdam & 655,468\\\hline
        The Hague & 553,417\\\hline\hline
\end{tabular}
```

Tables

Parameter options:

l Align columns to the left.

c Align columns to the centre.

r Align columns to the right.

Also note that just like images, tables can have captions and labels

Example

Name	Population
Amsterdam	903,399
Rotterdam	655,468
The Hague	553,417

Table 1: Biggest cities of NL

```
\begin{table}
\begin{tabular}{||l | c||}
...
\end{tabular}
\caption{Biggest cities of NL}
\label{table:BiggestCitiesNL}
\end{table}
```

The end

Questions?

Stuck? Mail us at
info@texnicie.nl

The slides can be found on
https://texnicie.nl

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