Exercises for the LaTeX introduction course

DTU LaTeX support – www.latex.dtu.dk

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All exercises should be solved in the same document.

1   A simple document

1. Open Texmaker/ShareLaTeX/Overleaf.

2. Create a simple document like the one shown below.

    ```
    \documentclass{article}
    \begin{document}
    Hello World!
    \end{document}
    ```

3. Save your LaTeX document (remember to write the file type: .tex).

4. Typeset the document to dvi (or pdf) by selecting LaTeX (or pdfLaTeX) in the menu next to the first arrow-button in the toolbar and then clicking the arrow-button.

5. To view the dvi (or pdf) file select "View DVI" (or "View PDF") from the second menu and click on the associated arrow-button.

Note: It is also possible to typeset the document using the terminal (or command line):
Use the command `cd` to change to the directory where your LaTeX file is.
Typeset the document by writing `pdflatex my_latex_document.tex`
If there are no errors you can now view the pdf file.

2 LaTeX in other languages

If you want to write in other languages than English you need to tell LaTeX to use the correct hyphenation patterns and to accept non-English characters. E.g. if you want to write Danish text you need to use the following packages and settings:

```
\usepackage[T1]{fontenc} % Better support for characters with accents
                         % and non-English characters
\usepackage[utf8]{inputenc} % Define the input encoding of your document.
                            % In this case 'utf8'
\usepackage{lmodern} % Latin Modern font (optional)
```

It is of great importance that the option for the inputenc package is the same as the encoding that your editor is configured to use.

To check which encoding Texmaker is configured to use select "Editor" in Texmaker's preferences and look for the option "Editor Font Encoding".

To get the correct hyphenation patterns add package babel in the preamble:

```
\usepackage[danish]{babel} % Danish hyphenation
```

All four packages must be included in the preamble (after the `\documentclass` command and before the `\begin{document}` command).

1. Insert the four packages in your preamble and write some Danish characters in your document.

Note: When you write English texts it is still a good idea to use the fontenc, the inputenc and the lmodern packages.

Note: In this exercise we have also shown how to write comments in LaTeX. Commented text will be skipped when you typeset the document, thus it will not appear in the output file (dvi, ps, or pdf).

3 Sections

1. Create a section structure like shown below.

1 Theory

1.1 Newtons laws

1.1.1 Newtons 1st Law

2. What happens if you use the *-version (e.g. **\section*{**<heading>**}**)?

3. Why is it not possible to use **\chapter{}**, in this document?

4 Math

When you write math in your document it is a good idea to include the mathtools and the bm (for making bold text in math **\bm{}**) packages in your preamble.

1. Create a new section called "Math"

2. Include the mathtools and the bm package in your preamble.

3. Create the following inline math:
   Einstein once wrote $E = mc^2$, which turned out to be true.

4. Create the following emphasised math:
   Einstein once wrote
   $$E = mc^2$$
   which turned out to be true.

5. Now create an equation with a number:
   Einstein once wrote
   $$E = mc^2 \tag{1}$$
   which turned out to be true.

5 Text formatting and layout

LATEX handles white space in a different way than e.g. MS Word. More than one space character between words are ignored. In math white space is completely ignored. If you for some reason want extra space you can use the commands **\quad** or **\qquad**.

A single line break in the LATEX file does not result in a line break in the output file, instead it will produce a normal inter word space. Two or more line breaks in the LATEX file results in a line break and an indent in the output file. This is the way you should produce line breaks in your document.

If you for some reason want to force LATEX to break a line you can use the command **\newline**, but try not to use it. If you do not like the indent style (every paragraph is indented) include the package parskip in the preamble (**\usepackage**{parskip}).

LATEX was created in the USA and therefore the default paper size is letter, therefore you must tell LATEX to use A4 paper if this is the paper you want: **\documentclass**[a4paper]{article}.

Formatting and layout commands:

Command	Function
\textbf{}	Bold text
\textit{}	Italic text
\texttt{}	Typewriter text
\emph{}	Emphasized text
\newline	Force LATEX to break the line
\quad and **\qquad**	Extra space in text and math

Exercise:

1. Create a new section called Formatting and layout.

2. Experiment with the different commands.

Example:
This is some formatted *text*.

Double line break results in a new line and an indent.   With **\qquad** it is possible to create horizontal space.

Maybe you have noticed that some characters, e.g. $, & or %, have special meanings in LATEX. If you want to write these characters in you document and make them appear in the output, you have to use commands. Here are some examples:

Command	Result
\$	$
\&	&
\%	%
$\backslash$	\

6 Lists

1. Create a new section called "Lists" and a subsection called "Bullet list".

2. Create the following list.

   - The first item.
   - The second item.

3. Create the following list.

   * An item with a star.
   - An item with a dash.

   Hint: in the itemize environment you can specify what character to use as bullet:
   \item[<optional character>]

4. Now create a new subsection called "numbered list" and create the following list.

   1. The first item.
   2. The second item.

7 References

One of the things that make LaTeX really great is the fact that cross-referring is really easy.

1. Start by going back in your document and place a label at the "Newton's laws" section. Also place a label at one of the numbered equations. The syntax is:

   \subsection{<some heading name>}**\label**{<label name>}

   \begin{equation}
     <equation>
     \label{<another label name>}
   \end{equation}

   A label name must be unique and can consist of any sequence of letters (do not use Danish letters), digits, or punctuation characters. Upper and lowercase letters are different.

2. Create a new section called References.

3. Now refer to the two labels. E.g. create the code for this:
   In section 1.1 on page 3...
   Equation (1) can be rearranged so $m = E/c^2$.

   Hint: use **\ref**{}, **\pageref**{} and **\eqref**{}

4. Typeset one time. Does it look correct? – no

5. Typeset one more time. It should now look right.
   When working with labels and references you have to typeset twice when a new label has been added or a label has been moved.

6. Try writing **\tableofcontents** in the top of your document (just after **\begin**{document}).
   What happens when you typeset?

7.1 cleveref

The package cleveref makes it even easier to do cross-referring. The package identifies the type of reference automatically and adds text like "section" or "eq. (1)".

Example: LaTeX code: In `\cref{sec:sections}` we show that the world is round. Einstein became famous for `\cref{eq:einstein}`.
Output: In Section 3 we show that the world is round. Einstein became famous for Equation (1).

8 Two ways to typeset

You can typeset your document in two ways:

1. Using the latex typesetter resulting in a dvi file;

2. Using the pdflatex typesetter which will create a pdf file.

But does it matter which typesetter you use? – Yes! Some packages only work with one of them and when you work with images it matters which typesetter you use (see slides).

1. Typeset your document using the "PDFLaTeX" button and show the result by clicking the "View PDF" button.

Note: If you are using Acrobat Reader, you don't have to close Acrobat Reader every time you have made a change, just reload the file by clicking Ctrl-R (File → Reload) after pdfLaTeX is done (this requires Adobe Acrobat 9 or newer).
Note: TeXmaker has a "Quick Build" button which can be used to typeset and view in one click. You can configure which typesetter to use in TeXmakers preferences section "Quick Build".

9 Images and figures

When you want to insert images you must load the graphicx package.

1. Insert the graphicx package in your preamble.

2. Download 'xfig_figure.png' from http://www.latex.dtu.dk/downloads/courses/miscellaneous/xfig_figure.png. Or you may use any other figure with extension png or pdf (for pdflatex) or eps (for latex).

3. Make sure that the figure is in the same directory as your LaTeX document.

4. Create a new section called "Images and figures".

5. Now insert the image in your document. Typeset your document using "PDFLaTeX" (png, jpg figures) or "LaTeX" (eps figures). The result should be something like in Figure 1.
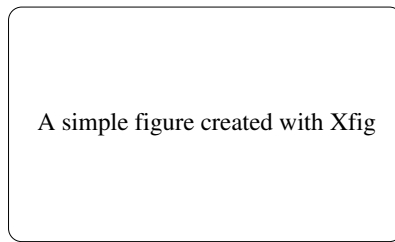
A simple figure created with Xfig

Figure 1: Here is a simple figure.

left	center	right
1	2	3

Table 1: A table

10   Tables

1. Create a new section called "Tables".

2. Create a table similar to Table 1.

   It is possible to create more stylish tables by using the booktabs package. This package gives you the following commands **\toprule**, **\midrule** and **\bottomrule** which can be used instead of **\hline**.

3. Add the booktabs package to your preamble.

4. Create a table similar to Table 2.

left	center	right
1	2	3
4	5	6

Table 2: A table

11 BibTeX

BibTeX is used to make the bibliography. BibTeX uses a special .bib file which contains all your sources (books, articles etc.). When your sources have been added to the BibTeX file and you have referred to these, you must run the BibTeX compiler on your .aux file.
A source (in this case a book) is written like this:

```
@book{companion,
  author = {Michel Goossens and Frank Mittelbach},
  title = {The \LaTeX\ Companion},
  publisher = {Addison-Wesley Publishing Company},
  year = {2004},
  edition = {2}
}
```

The first word after "@book{" (in this case "companion") is the label for this book. This label is used when you refer to the book, and must be unique.

In the LaTeX document you must write the following two lines in your preamble to 1) load the "biblatex" package and 2) load your bibliography file. For the third line, 3) you place it where you want the bibliography to appear in your document.

```
\usepackage[backend=bibtex]{biblatex}
\addbibresource{mybibfile}
\printbibliography
```

You can use Biber as backend by replacing "backend=bibtex" with "backend=biber" (or by removing the line, it's the default option). Now you can refer to you sources using the command `\cite[]{}`.

Example: the table is done as shown in `\cite[p. 132]{companion}`.

1. Create a BibTeX file containing the above mentioned book.

2. Add the three "bibliography" commands at the end of your document.

3. Add a `\cite[]{}` command some place in your document.

4. Typeset in this particular order:

   1. latex
   2. bibtex
   3. latex
   4. latex

Note: The BibTeX compiler can be started from Texmaker's "Tools" menu or by pushing F11. ShareLaTeX and Overleaf do this by default when compiling.

Note: It is only necessary to rerun the BibTeX compiler if you add a new source to the .bib file or refer to at source that has not been referred to before.

Note: Biber is a BibTeX-replacement which is more modern and powerful. Texmaker must be configured to use Biber instead of BibTeX. ShareLaTeX and Overleaf adapts to what you specify as backend in the biblatex options.