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Getting started with \LaTeX Figures, Tables and Formulae



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Including Graphics: The `graphicx`-package

- Have a `png`, `jpg` or `pdf` file;
- Load the `graphicx`-package using: `\usepackage{graphicx}`
- Include the file using: `\includegraphics[key=value,...]{file}`
 - `file` is the filename without the extension (`png/jpg`)
 - `key`: `width`, `height`, `scale`, `angle`
 - `value`: a value in the proper unit (`cm`, `in`, `ex`, `em`, ...)
- How to use it:


Syntax:

`\includegraphics[key=value,...]{file}`

Code example:

`I \includegraphics[width=1em]{images/heart2.png} Zurich!?????`

produces:

I  Zurich!

Create your own LaTeX document with some text and include a local image!

- Code Example:

```
I \includegraphics[width=1em]{images/heart2.png} Zurich!
```

- Enhanced Code Example:

```
I \raisebox{-.3\height} {  
  \includegraphics[width=1em]{images/heart2.png}  
} Zurich, specially the  
  \includegraphics[trim=0cm 2.4cm 2.2cm 0cm,clip,width=6ex]  
  {images/Zoo_Zurich.png}  
on the Z\"uriberg!
```

I ❤️ Zurich, specially the **zoo** on the Züriberg!



The tabular Environment

Our prices are per kilo:	Fruit	Price
	Apples	2.45 €
	Oranges	3.70 €
	Cranberries	19.99 \$

Corresponding tabular code:

```
Our prices are per kilo:
\begin{tabular}{l|c}
  Fruit & Price \\
\hline
  Apples & 2.45 \EUR{} \\
  Oranges & 3.70 \EUR{} \\
  Cranberries & 19.99 \$ \\
\end{tabular}
```

The tabular Environment

```

    Floating text above or on the right side.
\begin{tabular}[position]{columns specification}
  Fruit & Price & \\
\hline
  Apples & 2.45 \EUR{} & \\
  Oranges & 3.70 \EUR{} & \\
  Cranberries & 19.99 \$ & \\
\end{tabular}
    Floating text below or on the left side.

```

- *position*: t(op), c(entre), b(ottom). Adjusts the vertical position of the table relative to the baseline of the surrounding text;
- *columns specification* defines the format of the columns: Use l(left), r(right) or c(entered) to align the text inside the column. Use p{width} for justified text inside a column of width *width*. Separate columns by nothing or with one (or multiple) | for vertical line(s);
- inside the table, use & to separate cells and \\ to go to the next row;
- use \hline (or \cline) for a (partial) horizontal line.

Tables

Exercise: Tabular Tuning

```
Our prices are per kilo:
\begin{tabular}{l|c}
  Fruit & Price \\
\hline
Apples & 2.45 \EUR{} \\
Oranges & 3.70 \EUR{} \\
Cranberries & 19.99 \$ \\
\end{tabular}
% What about other fruits?
```

Expand the code above to finally look like this:

Our prices are per kilo:		Fruit	Price	Actually we do not have avocados.
	1.	Apples	2.45 €	
	2.	Oranges	3.70 €	
	3.	Cranberries	19.99 \$	
	4.	Coconuts	6.75 £	



Spanning Columns - Introduction and Exercise

	Research Institutes			
	Dübendorf		Villigen	Birmensdorf
	Eawag	Empa	PSI	WSL
Journal Article	11278	14407	31141	11543
Newspaper/Magazine Article	1245	1238	34	3387
(Edited) Book	282	404	44	920
Book Chapter	739	742	458	2820
Proceedings Paper	1095	4613	4113	2370

```

\begin{tabular}{l|c|c|c|c}
~ & \multicolumn{4}{c}{ Research Institutes } & \\
\cline{2-5}

% ... >>> lost row(s) with locations <<< ...

~ & Eawag & Empa & PSI & WSL & \\
\hline
Journal Article & 11278 & 14407 & 31141 & 11543 & \\
Newspaper/Magazine Article & 1245 & 1238 & 34 & 3387 & \\
(Edited) Book & 282 & 404 & 44 & 920 & \\
Book Chapter & 739 & 742 & 458 & 2820 & \\
Proceedings Paper & 1095 & 4613 & 4113 & 2370 & \\
\end{tabular}

```



Fruit	Price
Apples	2.45 €
Oranges	3.70 €
Cranberries	19.99 \$

Table 1: Fruit prices

Our prices are given in table 1.
Prices are per kilo. Actually we do not have avocados.

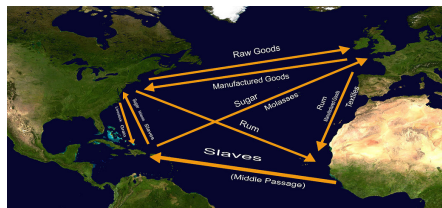


Figure 1: Historical overseas trade

Figure 1 illustrates the trade across the Atlantic in the 16th century.
Source: https://en.wikipedia.org/wiki/File:Detailed_Triangle_Trade.jpg

The figure & table Environment

```
\begin{table}[placement specifiers]
  # ... tabular code ...
  \caption{some_text}
  \label{some_unique_tabular_label}
\end{table}
```

```
\begin{figure}[placement specifier]
  # ... code to include image file ...
  \caption{some_text}
  \label{some_unique_figure_label}
\end{figure}
```

- always place **label** after **caption**!
- the *placement specifiers* are a set of letters to effect a specific placement:

t :	place it on top of a page	h :	place it here (i.e. where the code occurred)
b :	place it on the bottom of a page	p :	place it on a special page at the document end
! :	skip aesthetic considerations and place it even if the result is probably not so pretty		

Tables

Example of the table Environment

Fruit	Price
Apples	2.45 €
Oranges	3.70 €
Cranberries	19.99 \$

Table 1: Fruit prices

Our prices are given in table 1.
Prices are per kilo. Actually we do not have avocados.

```
Our prices are given in table~\ref{tab:pricelist}.
\begin{table}
  \begin{tabular}{c|c}
    Fruit & Price \\
    \hline
    Apples & 2.45 \EUR{} \\
    Oranges & 3.70 \EUR{} \\
    Cranberries & 19.99 \$ \\
  \end{tabular}
  \caption{Fruit prices}
  \label{tab:pricelist}
\end{table}
\\ Prices are per kilo. Actually we do not have avocados.
```



- Load the `amsmath`-package using: `\usepackage{amsmath}`

$$\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{(-1)^k}{2k-1} = \int_1^2 \frac{1}{x} dx = \ln 2$$

$$\forall x \in \mathbb{R} \setminus \{0\} : \quad x^2 > 0 \wedge \sqrt[4]{\frac{1}{x-4}} = |x|$$

$$|x| \neq \begin{cases} -x, & \text{if } x > 0, \\ 0, & \text{if } x = 0, \\ x, & \text{if } x < 0. \end{cases}$$

$$\vec{u} \cdot \vec{v} \leq \|\vec{u}\| \|\vec{v}\| \quad U \not\subset \left\{ z \in \mathbb{C} \mid \operatorname{Re} z > 0, \operatorname{Im} z > 0 \right\}$$

$$\Gamma_{ij}^k = \frac{1}{2} (g^{-1})^{kl} \left(\partial_{x^i} g_{jl} + \partial_{x^j} g_{il} - \partial_{x^l} g_{ij} \right)$$

$$R^\alpha{}_{\gamma\mu\nu} = g^{\alpha\beta} R_{\beta\gamma\mu\nu}$$

Different Ways to show Formulae

- In line formulae

```
Einstein is popular for $E = mc^2$ - he achieved so much more though\ldots
```

Einstein is popular for the formula $E = mc^2$ - he achieved so much more though...

- The equation environment

```
Einstein is popular for the formula given in equation \eqref{eq:emc2} below.  
\begin{equation}  
    E = mc^2  
    \label{eq:emc2}  
\end{equation}
```

Einstein is popular for the formula given in equation (1) below.

$$E = mc^2 \tag{1}$$

I do not know where `$\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}$` has some relevance...

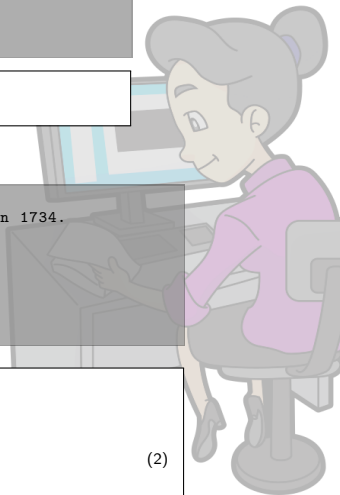
I do not know where $\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}$ has some relevance...

The Basel-problem-`\eqref{eq:basel}` was finally solved by Leonhard Euler in 1734.

```
\begin{equation}
  \lim_{n \rightarrow \infty}
  \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}
  \label{eq:basel}
\end{equation}
```

The Basel problem (2) was finally solved by Leonhard Euler in 1734.

$$\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6} \quad (2)$$



Appendix

Image Sources

Slide background image:

- https://commons.wikimedia.org/wiki/File:Cartoon_Woman_Encoding_Data_On_A_Desktop_Computer_At_Work.svg
CC BY-SA (<https://creativecommons.org/licenses/by-sa/4.0/legalcode>)

Figures:

- https://de.wikipedia.org/wiki/Datei:Logo_Zoo_Z%C3%BCrich.svg
Trademark
- https://commons.wikimedia.org/wiki/File:Detailed_Triangle_Trade.jpg
Public Domain
- <https://commons.wikimedia.org/wiki/File:Cora%C3%A7%C3%A3o-icone.png>
Public Domain