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Getting started with \LaTeX

Figures, Tables and Formulæ



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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, angle, scale
 - ➞ value: a value in the proper unit (cm, in, ex, em, ...)
- ➞ Example:

```
\includegraphics[key=value, ...]{file}  
...  
I \includegraphics[height=0.9em]{images/heart2.png} Zurich !
```

produces:

I ❤️ Zurich !

The figure environment

```
\begin{figure}[placement specifier]
  \includegraphics[key=value,...]{file}
  \caption{some_text}
  \label{some_label}
\end{figure}
```

- ↳ the *placement specifier* is a combination of
- ↳ h: place the float here (i.e. where the code occurred);
 - ↳ t: place the float on top of a page;
 - ↳ b: place the float on the bottom of a page;
 - ↳ p: place the float on a special page at the end of the document;
 - ↳ !: ignore æsthetical considerations and place the float even if the result is not so pretty
- ↳ Always place the label after the caption!

Figures

The figure environment

```
\begin{center}
  \begin{figure}
    \includegraphics[width=15cm]{image-tri-trade-16th.jpg}
    \caption{Historical overseas trade}
    \label{img:atlantic-trade}
  \end{figure}
  Figure~\ref{img:atlantic-trade} illustrates the trade
  across the Atlantic in the 16th century. \\
  Source:
  \url{https://en.wikipedia.org/wiki/File:Detailed\_Triangle\_Trade.jpg}
\end{center}
```

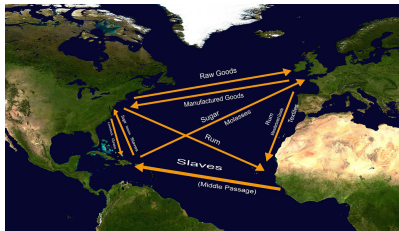
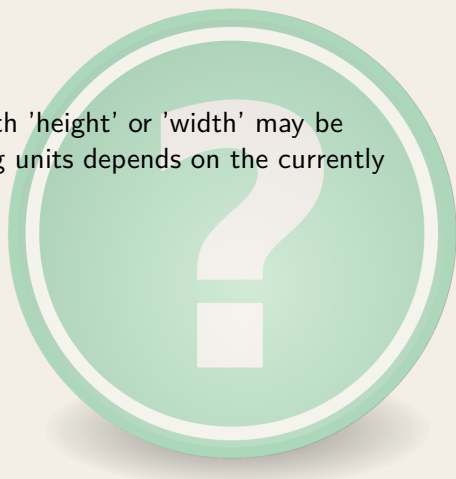


Figure 1: Historical overseas trade

Figure 1 illustrates the trade across the Atlantic in the 16th century.
Source: <https://en.wikipedia.org/wiki/File:Detailed.Triangle.Trade.jpg>

Specifying the size of an image with 'height' or 'width' may be useful. But which of the following units depends on the currently used font size?

1. cm
2. in
3. em



Tables

The tabular environment

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

```
\begin{tabular}{c|c}
  Fruit & Price \\
\hline
  Apples & 2.45 \EUR{} \\
  Oranges & 3.70 \EUR{} \\
  Cranberries & 19.99 \$ \\
\end{tabular}
```

The tabular environment

```
\begin{tabular}[position]{columns specification}
  Fruit & Price \\
  \hline
  Apples & 2.45 \EUR{} \\
  Oranges & 3.70 \EUR{} \\
  Cranberries & 19.99 \$ \\
\end{tabular}
```

- ➞ *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 | for a vertical line;
- ➞ Inside the table, use & to separate cells, \\ to go to the next row and \hline for a horizontal line.

The tabular environment

Our prices are per kilo:	Fruit	Price	Actually we do not have avocados.
	Apples	2.45 €	
	Oranges	3.70 €	
	Cranberries	19.99 \$	

```

Our prices are per kilo:
\begin{tabular}{c|c}
  Fruit & Price \\
\hline
  Apples & 2.45 \EUR{} \\
  Oranges & 3.70 \EUR{} \\
  Cranberries & 19.99 \$ \\
\end{tabular}
Actually we do not have avocados.

```


The table environment

```
\begin{table}[placement specifier]
...
\caption{some_text}
\label{some_label}
\end{table}
```

- ↳ the *placement specifier* is a combination of
- ↳ h: place the float here (i.e. where the code occurred);
 - ↳ t: place the float on top of a page;
 - ↳ b: place the float on the bottom of a page;
 - ↳ p: place the float on a special page at the end of the document;
 - ↳ !: ignore æsthetical considerations and place the float even if the result is not so pretty

↳ Always place the label after the caption!

The table environment

```

Our prices are given in table~\ref{tab:pricelist}.
\begin{table}
  \begin{center}
    \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{center}
\end{table}
\\ Prices are per kilo. Actually we do not have avocados.

```

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.

Tables

Spanning columns

```
\begin{tabular}{l|c|c|c|c}
& \multicolumn{4}{c}{\bfseries Research Institutes} \\
\cline{2-5}
& Eawag & Empa & PSI & WSL \\
\hline
Journal Article & 9487 & 10708 & 20766 & 8829 \\
Newspaper/Magazine Article & 1225 & 1046 & 30 & 3186 \\
(Edited) Book & 293 & 364 & 23 & 842 \\
Book Chapter & 852 & 633 & 187 & 2496 \\
Proceedings Paper & 706 & 3918 & 2123 & 2157 \\
\end{tabular}
```

	Research Institutes			
	Eawag	Empa	PSI	WSL
Journal Article	9487	10708	20766	8829
Newspaper/Magazine Article	1225	1046	30	3186
(Edited) Book	293	364	23	842
Book Chapter	852	633	187	2496
Proceedings Paper	706	3918	2123	2157

Which statement about the following table structure is true?



```
\begin{tabular}{1|c|r}
  \multicolumn{2}{c}{\textbf{Citrus fruits}} & \\
  Oranges & Grapefruits & Bananas \\
  Spain & South Africa & Brazil \\
\end{tabular}
```

1. 'Oranges', 'Grapefruits' and 'Bananas' are horizontally centered inside their cells.
2. There is no content assigned for the cell above 'Bananas'.
3. There will be a line drawn above the cells for 'Oranges' and 'Grapefruits'.

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

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

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

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

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

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

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

➡ Use the package $\mathcal{A}\mathcal{M}\mathcal{S}\text{-}\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ (`\usepackage{amsmath}`)

➡ In line formulæ

```
Einstein is popular for the formula $E = mc^2$.  
He did achieve so much more, though\ldots
```

Einstein is popular for the formula $E = mc^2$. He did achieve so much more, though...

➡ The equation environment

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

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

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

$$\text{\$}a^2 + b^2 = c^2\text{\$}$$

$$a^2 + b^2 = c^2$$

```
\lim_{n \to \infty} \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}.
```

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

```
\begin{equation}
\lim_{n \to \infty}
\sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}
\end{equation}
```

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

In the 5th century a Chinese mathematician discovered that $\pi \approx \frac{355}{113}$ which is a remarkable approximation for Pi. The resulting value is just about $2.667642 * 10^{-7}$ greater.

Only one of the following statements is appropriate:

1. For these two mathematical terms the 'in-line' mode was used which does not need additional functions or packages.
2. Also for an approximation like here `\begin{equation}` and `\end{equation}` are required.
3. For the two mathematical terms the 'in-line' mode was used, in both cases it started and ended with a \$ symbol.