Lib4RI

Federico Cantini <federico.cantini@lib4ri.ch>
Frank Hösli <frank.hoesli@lib4ri.ch>

Webinar 4: Getting started with LaTeX

Figures, Tables and Formulæ

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!

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:
    https://en.wikipedia.org/wiki/File:Detailed\_Triangle\_Trade.jpg
\end{center}
```

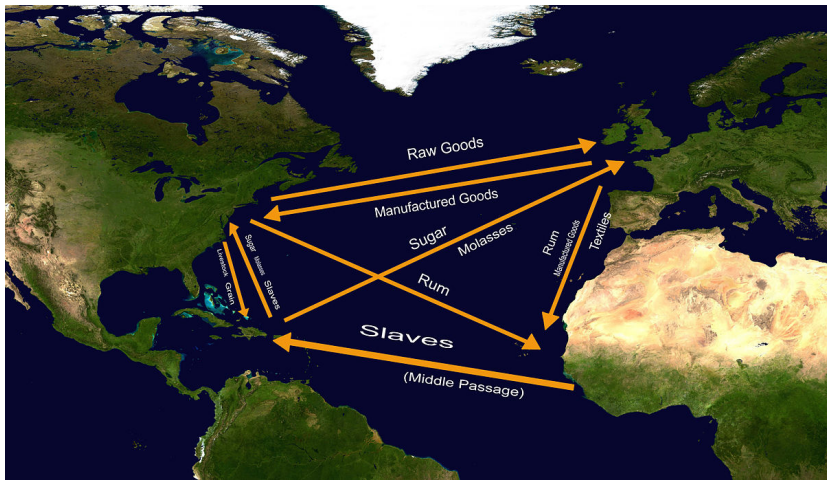
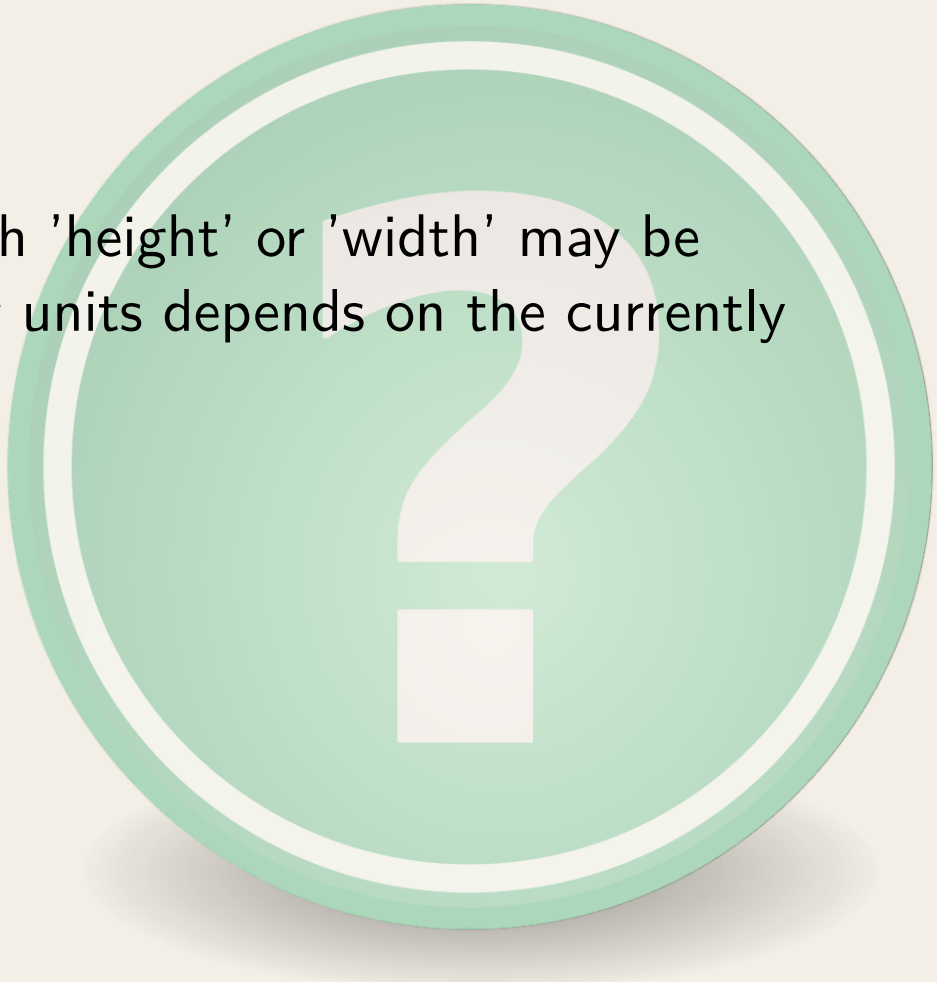


Figure 1: Historical overseas trade

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

Specifing 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



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`(eft), `r`(ight) or `c`(entred) 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
Apples	2.45 €
Oranges	3.70 €
Cranberries	19.99 $

Actually we do not have avocados.

```
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.

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             &  9248  & 10292  & 20120 &  8465 \\
    Newspaper/Magazine Article  &  1216  &  1036  &    28 &  3249 \\
    (Edited) Book               &   292  &   354  &    23 &   826 \\
    Book Chapter                &   830  &   604  &   181 &  2440 \\
    Proceedings Paper           &   637  &  3697  &  2087 &  2005 \\
\end{tabular}
```

	Research Institutes			
	Eawag	Empa	PSI	WSL
Journal Article	9121	9996	19217	8207
Newspaper/Magazine Article	1218	1060	30	3207
(Edited) Book	277	351	20	861
Book Chapter	808	594	169	2312
Proceedings Paper	641	3684	2053	1991

Which statement about the following table structure is true?

```
\begin{tabular}{l|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'.

Mathematical Formulæ

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

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

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

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

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

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

Math modes and equation numbers

- Use the package $\mathcal{AMS}$-LaTeX (`\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.

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

Examples

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

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

Examples

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

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

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

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

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.