



Taming LaTeX's Page Layout: A Step-by-Step Guide for Book Authors



Introduction: Custom page layout with LaTeX

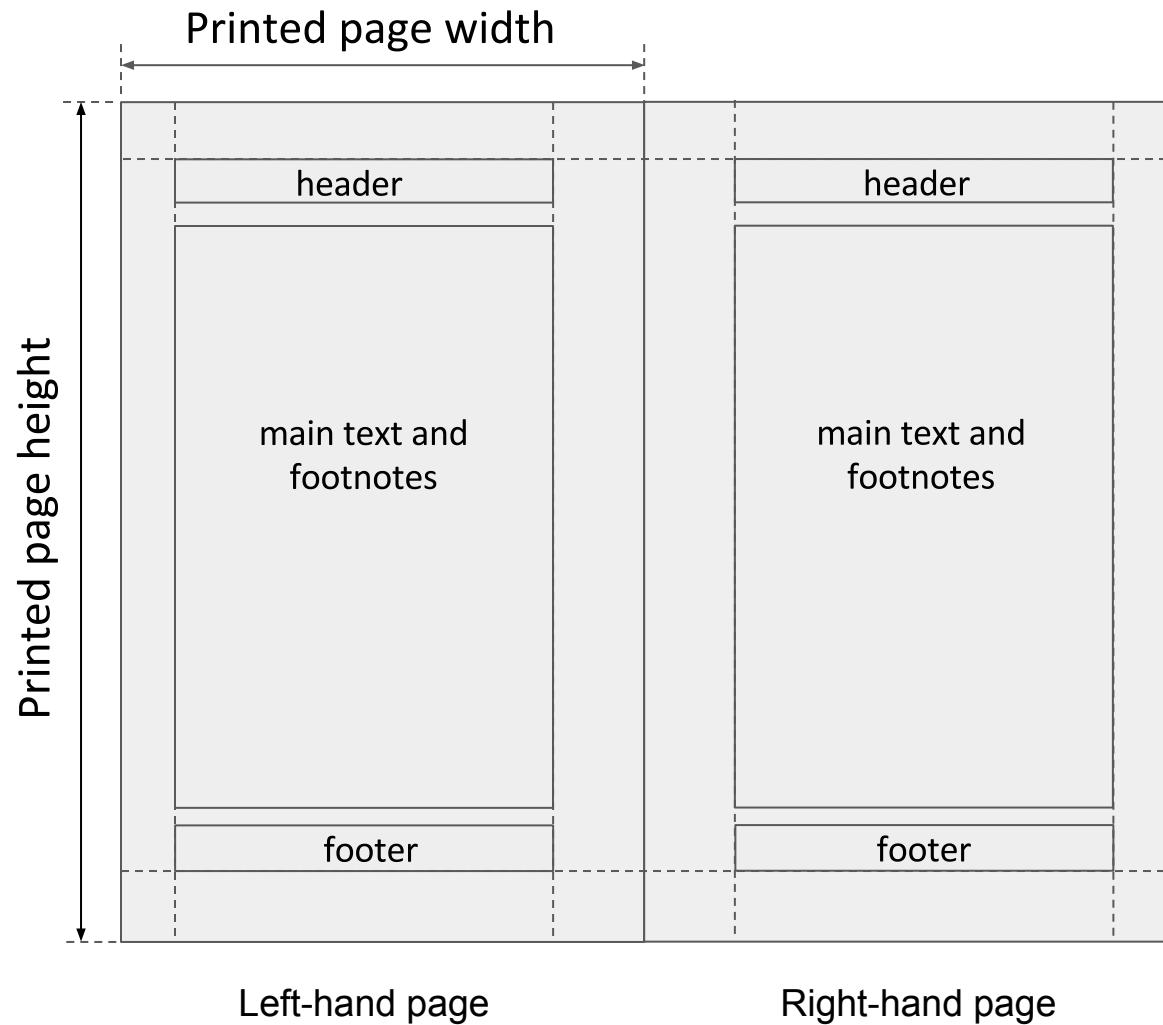
- Using LaTeX to achieve custom page layouts—e.g., for books—can be challenging.
- You might want to produce a book in LaTeX—perhaps based on someone else's design, but...
 - book designers rarely use LaTeX: their designs are usually prepared and specified using tools such as Adobe InDesign;
 - print-on-demand (POD) companies typically do not provide templates or guidance/support for LaTeX users.

The challenge: How can you implement layouts/designs from the print-and-design world using LaTeX's view of the page? It *can be done*, read on...

Quick review: Text areas for a “conventional” book design

A book's page width and height are called the *trim size*.

- E.g.: a trim size of 234mm × 156mm implies pages are 234mm tall and 156mm wide.
- Beware of country conventions and the order of writing width and height. Is it:
 - width × height, or height × width



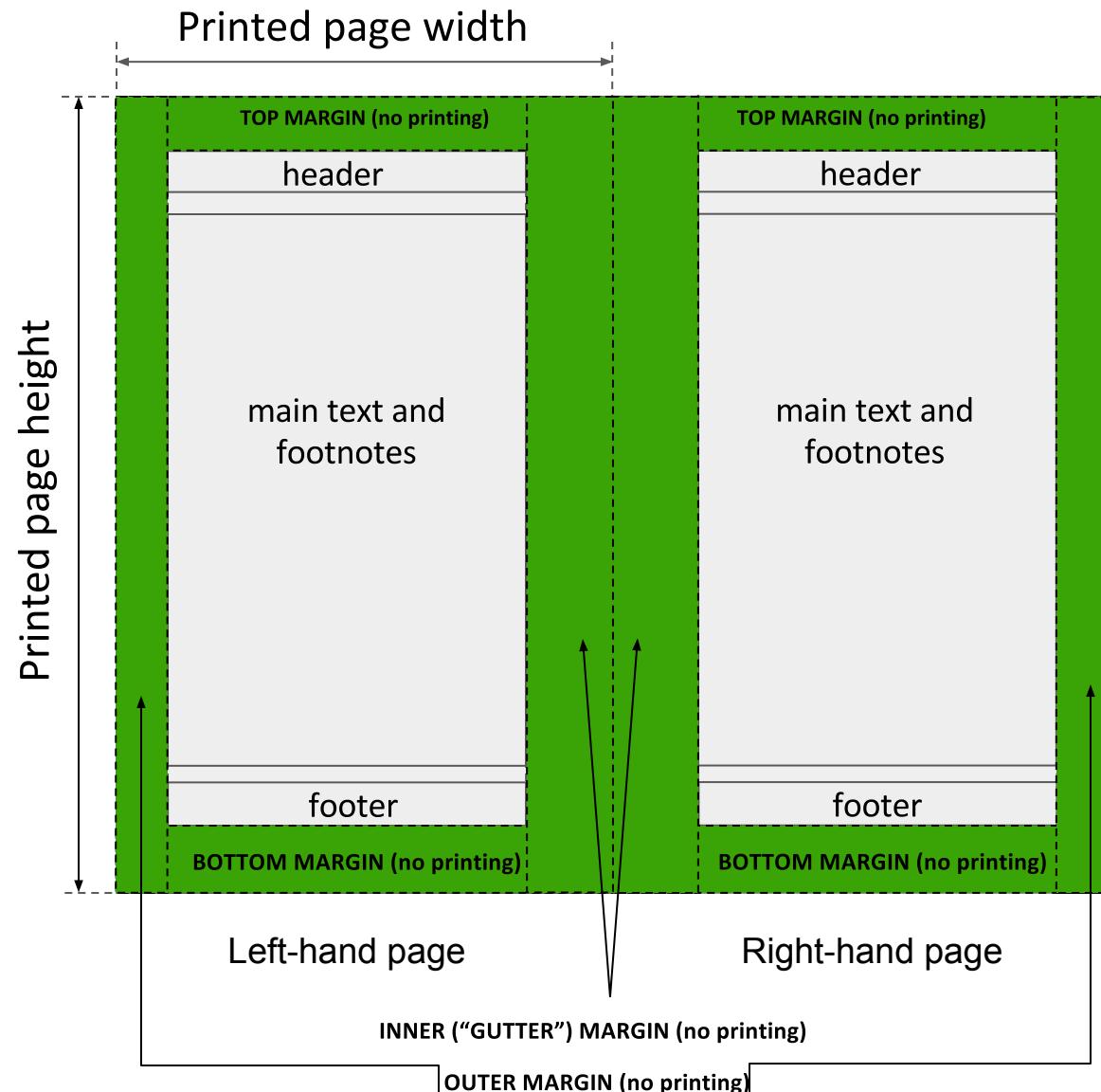
Quick review: Important book margins

Click (or tap) to see the book margins highlighted.

- Be mindful of the manufacturing process: avoid text being trimmed off!
- The inner margin is also called the *gutter margin*.

Choose an appropriate gutter margin:

- Avoid any printed material being too close to the book fold: can be very frustrating for the reader!



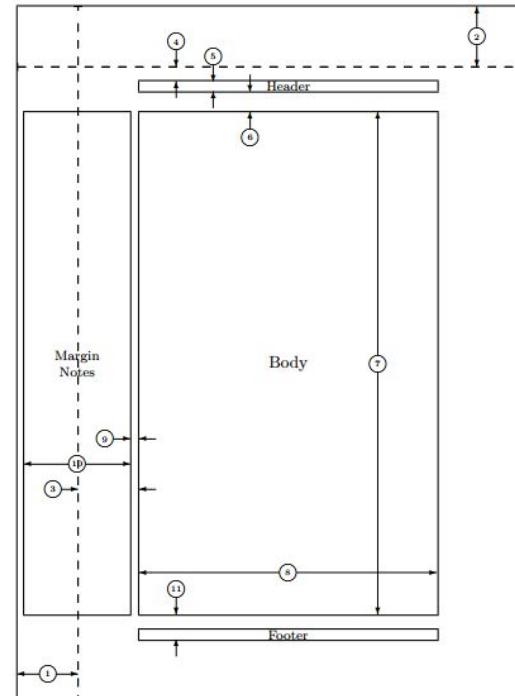
Two world views of the page: LaTeX's and everyone else's

- TeX/LaTeX2e provide many parameters which define/control the page layout:
 - `\hoffset`, `\voffset`, `\oddsidemargin`,
`\topmargin`, `\headheight`, `\headsep`,
`\textheight`, `\textwidth`,
`\marginparsep`, `\marginparwidth`,
`\footskip`
- Achieving your design by modifying these parameters can be time-consuming.
- There are packages to help with page layout (notably `geometry.sty`) but if you want to have more control and understanding, then read on.

Challenge

How do we “map” from LaTeX's view of the page to the standard model used by the print and design world?

LaTeX page layout parameters: diagram generated by the `layout` package.



```
1 one inch + \hoffset          2 one inch + \voffset
3 \oddsidemargin = 73pt        4 \topmargin = 17pt
5 \headheight = 12pt            6 \headsep = 25pt
7 \textheight = 598pt           8 \textwidth = 355pt
9 \marginparsep = 11pt          10 \marginparwidth = 126pt
11 \footskip = 30pt             \marginpush = Opt (not shown)
\hoffset = 0pt                  \voffset = Opt
\paperwidth = 597pt              \paperheight = 845pt
```

The mysterious `\hoffset` and `\voffset`

- It is a “TeX convention” that the reference point (origin) of the output is at a point 1 inch (25.4mm) from the left edge of the paper and 1 inch (25.4mm) down from the top edge of the paper.
- You can move that reference point through the parameters `\hoffset` (horizontal offset) and `\voffset` (vertical offset). For PDF output, pdfTeX and LuaTeX also provide equivalents called `\pdfvorigin` and `\pdfhorigin`
- By today’s standards (PostScript and PDF) this is a little quirky, but that’s just the way it is with TeX-based typesetting.

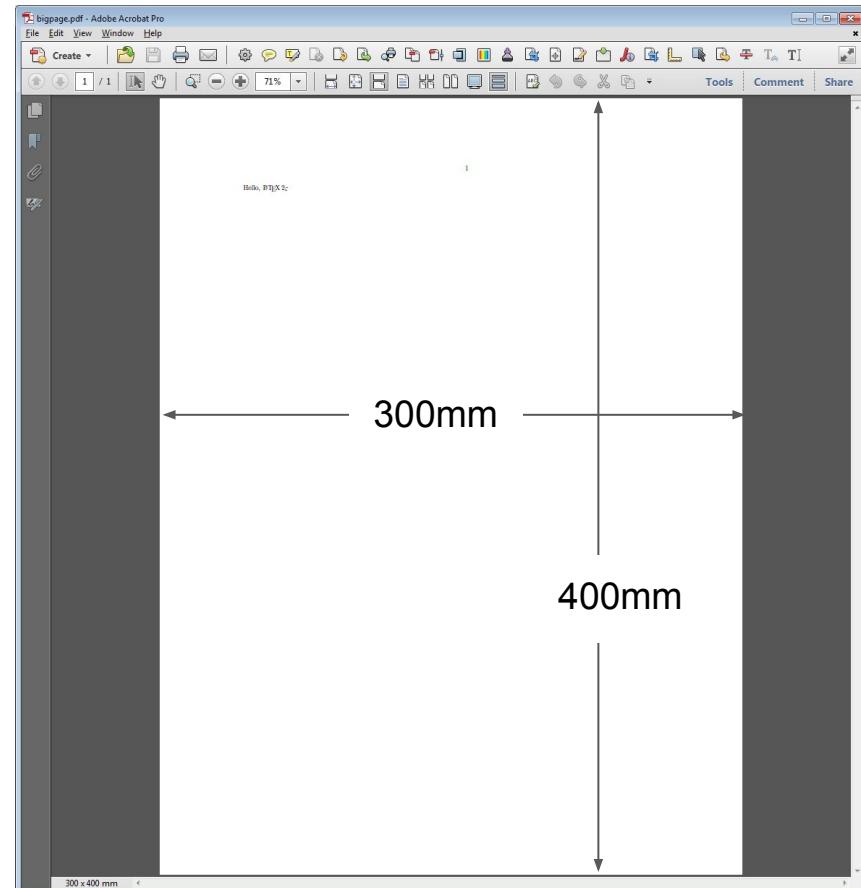
How to set the PDF document page size

The width and height of the pages in the PDF document can be controlled by the following commands:

- `\pdfpageheight`
- `\pdfpagewidth`
- ✓ Supported by pdfLaTeX, XeLaTeX, and LuaLaTeX

Example:

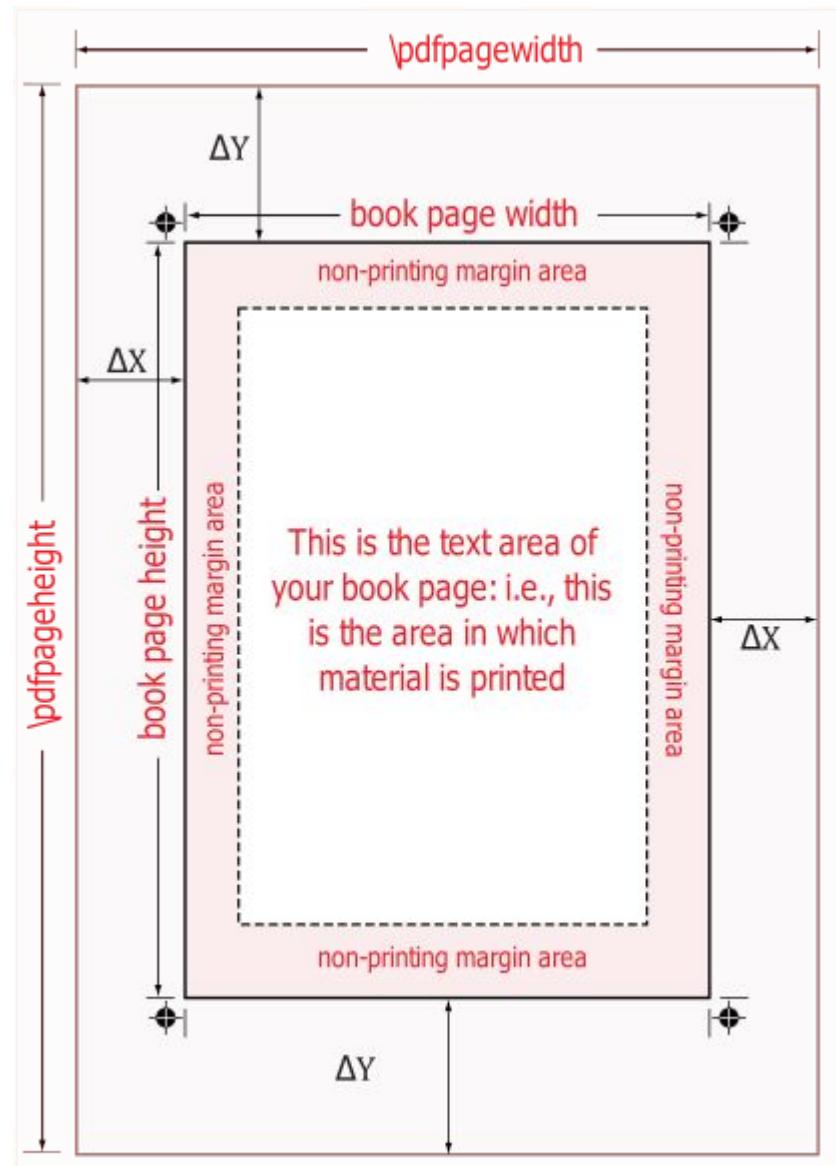
```
\documentclass[twoside]{book}
\begin{document}
\pdfpagewidth=300mm
\pdfpageheight=400mm
Hello, \LaTeXe
\end{document}
```



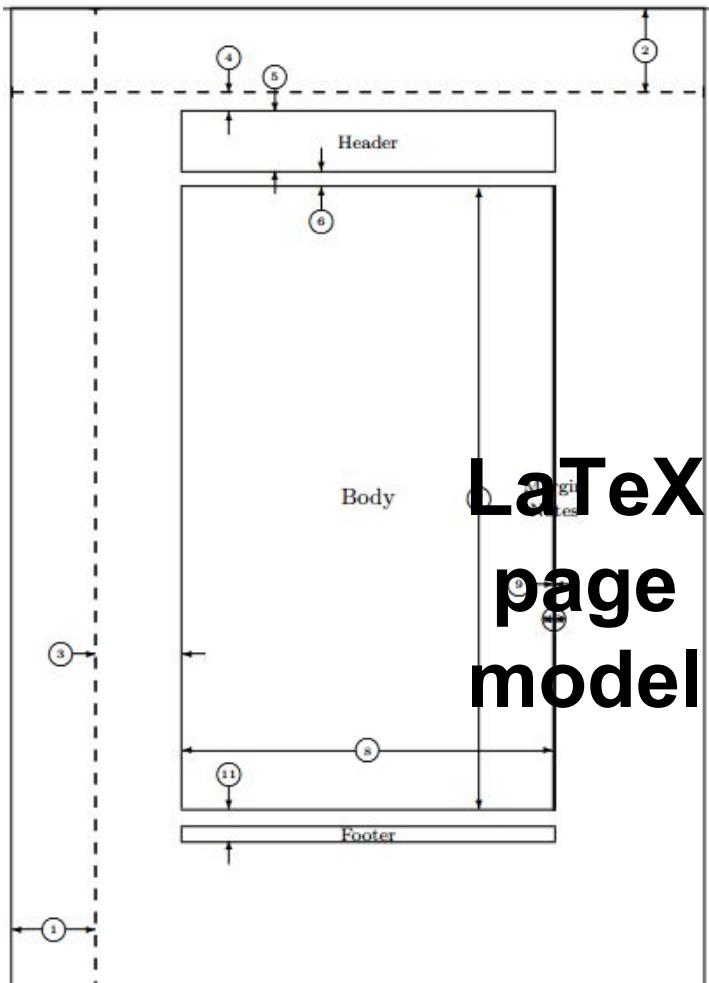
A PDF document with pages measuring 300mm wide and 400mm tall.

What are we aiming to achieve?

- We want the book page to be horizontally and vertically centred on our chosen PDF page size (i.e., our preferred paper size).
- We want to implement our book design in LaTeX.
- We want a method for calculating LaTeX's layout parameters based on the page sizes and margins provided by a book designer.



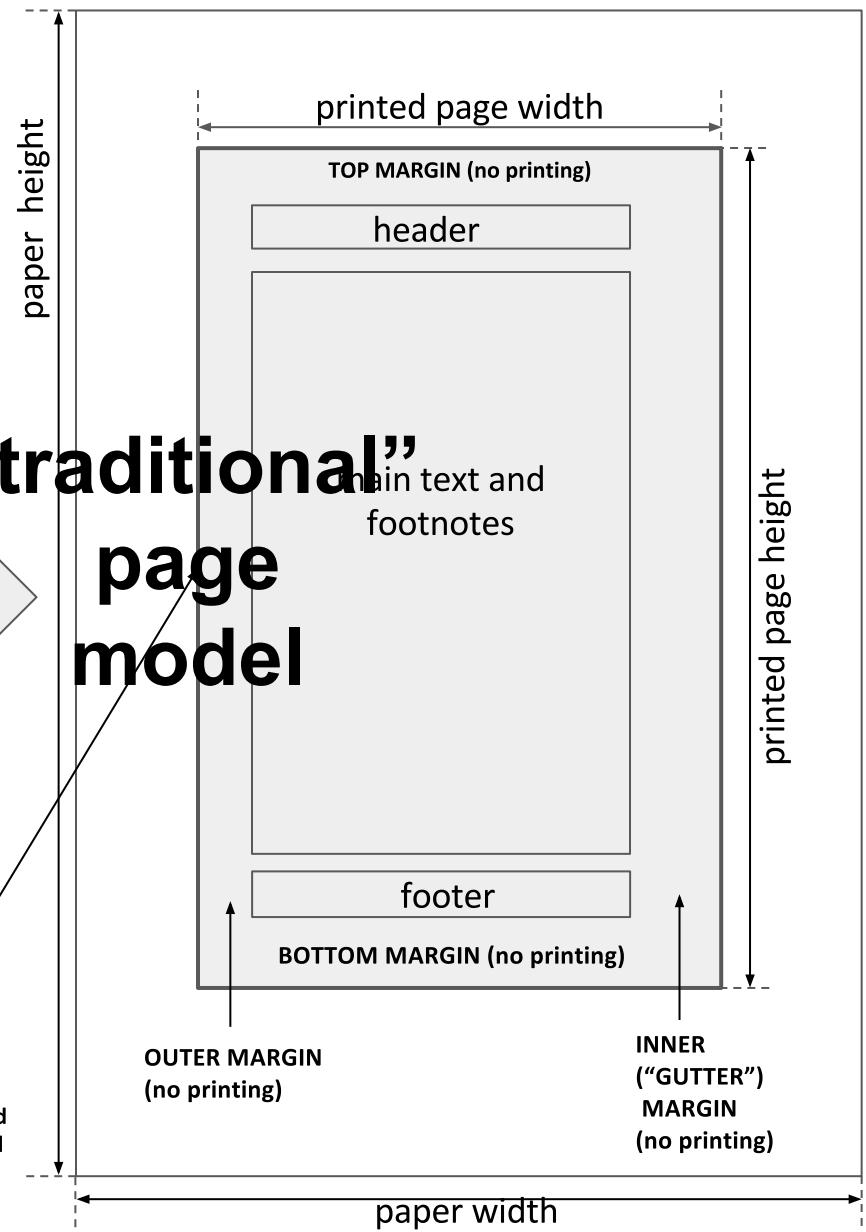
Our goal: Map between two “world views”



**LaTeX
page
model**

```
1 one inch + \hoffset          2 one inch + \voffset
3 \oddsidemargin = 75pt        4 \topmargin = 17pt
5 \headheight = 5pt             6 \headsep = 14pt
7 \textheight = 537pt            8 \textwidth = 321pt
9 \marginparsep = 0pt           10 \marginparwidth = 0pt
11 \footskip = 28pt              \marginparpush = 5pt (not shown)
                                \voffset = 0pt
                                \paperheight = 845pt
```

Book page
horizontally and
vertically centred
on our preferred
paper size



**“traditional”
page
model**

OUTER MARGIN
(no printing)

INNER
("GUTTER")
MARGIN
(no printing)

paper width

paper height

printed page height

printed page width

A note on the layout diagrams (on the following slides)

Note to readers: The following slides contain diagrams which are the result of reading, research and testing—*don't worry about how they were derived*. Yes, do study them—but the key point is...

...to help you
save some
time.

A right-hand (odd-numbered) page

LaTeX's view of a left-hand page overlaid onto "conventional" page layout software.

The book page is horizontally and vertically centred on the PDF page area (your chosen paper size).

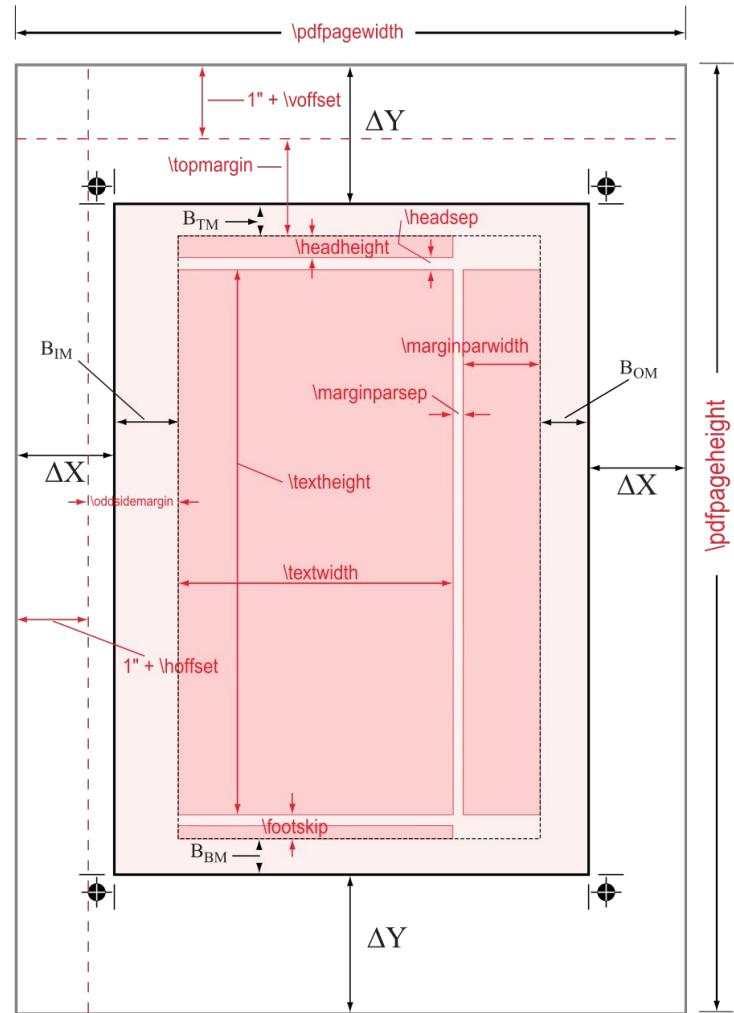
ΔX , ΔY are values for centering the book page on the PDF paper size:

$$\Delta X = \frac{1}{2}(\text{\textbackslash pdfpagewidth} - \text{book-page-width})$$

$$\Delta Y = \frac{1}{2}(\text{\textbackslash pdfpageheight} - \text{book-page-height})$$

The book margins are denoted by:

- B_{TM} = book top margin
- B_{OM} = book outside margin
- B_{BM} = book bottom margin
- B_{IM} = book inner margin



A right-hand (odd-numbered) page [continued]

From the diagram we can write down some simple equations.

For the width:

$$\begin{aligned}\text{\pdffpagewidth} &= 1" + \text{\hoffset} \\ &\quad + \text{\oddsidemargin} \\ &\quad + \text{\textwidth} + \text{\marginparsep} \\ &\quad + \text{\marginparwidth} + B_{OM} + \Delta X\end{aligned}$$

also:

$$1" + \text{\hoffset} + \text{\oddsidemargin} = B_{IM} + \Delta X$$

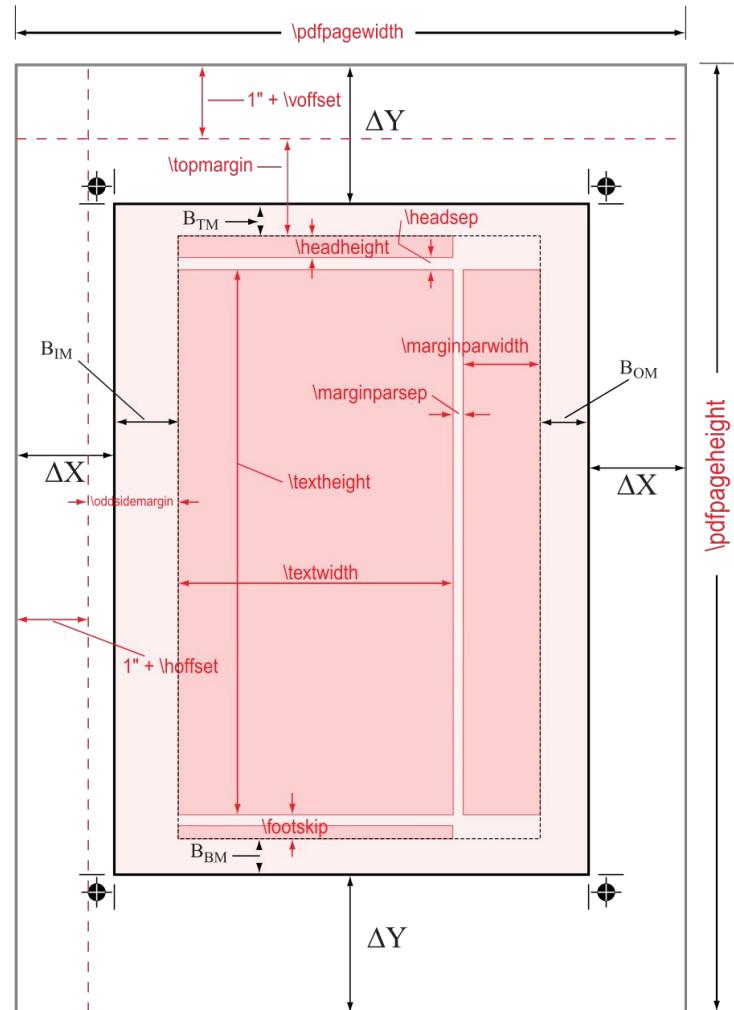
For the height:

$$\begin{aligned}\text{\pdfpageheight} &= 1" + \text{\voffset} \\ &\quad + \text{\topmargin} + \text{\headheight} \\ &\quad + \text{\headsep} + \text{\textheight} \\ &\quad + \text{\footskip} + B_{BM} + \Delta Y\end{aligned}$$

also:

$$1" + \text{\voffset} + \text{\topmargin} = B_{TM} + \Delta Y$$

These equations allow us to calculate LaTeX's parameters from the basic book design!



A left-hand (even-numbered) page

LaTeX's view of a left-hand page overlaid onto "conventional" page layout software.

The book page is horizontally and vertically centred on the PDF page area (your chosen paper size).

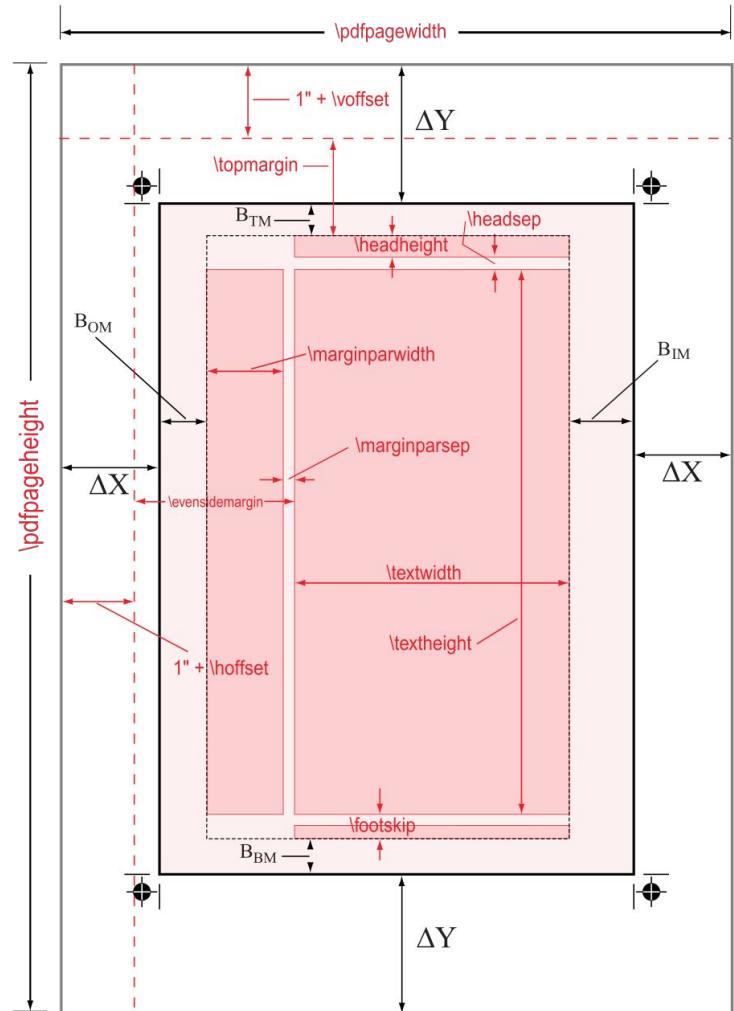
ΔX , ΔY are values for centering the book page on the PDF paper size:

$$\Delta X = \frac{1}{2}(\text{\textbackslash pdfpagewidth} - \text{book-page-width})$$

$$\Delta Y = \frac{1}{2}(\text{\textbackslash pdfpageheight} - \text{book-page-height})$$

The book margins are denoted by:

- B_{TM} = book top margin
- B_{OM} = book outside margin
- B_{BM} = book bottom margin
- B_{IM} = book inner margin



A left-hand (even-numbered) page [continued]

From the diagram we can write down some simple equations.

For the width:

$$\begin{aligned}\text{\textbackslash pdfpagewidth} = & 1" + \text{\textbackslash hoffset} \\ & + \text{\textbackslash evensidemargin} \\ & + \text{\textbackslash textwidth} + B_{IM} + \Delta X\end{aligned}$$

also:

$$\begin{aligned}1" + \text{\textbackslash hoffset} + \text{\textbackslash evensidemargin} = & \\ \Delta X + B_{OM} + \text{\textbackslash marginparwidth} + \text{\textbackslash marginparsep} = &\end{aligned}$$

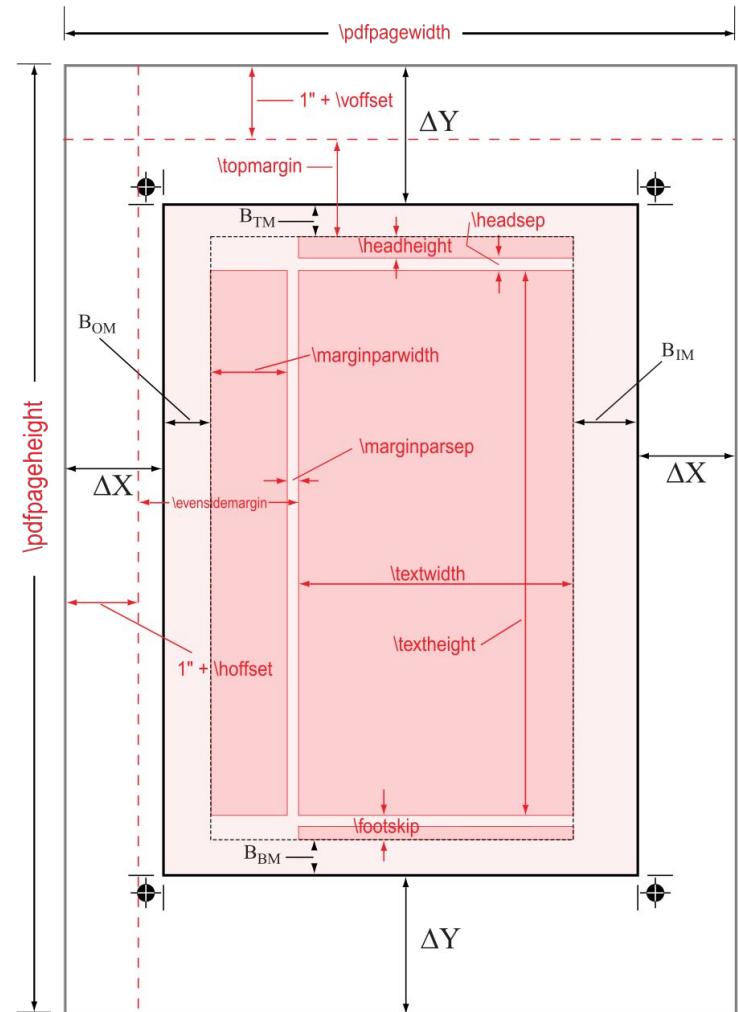
For the height (same as right-hand page):

$$\begin{aligned}\text{\textbackslash pdfpageheight} = & 1" + \text{\textbackslash voffset} \\ & + \text{\textbackslash topmargin} + \text{\textbackslash headheight} \\ & + \text{\textbackslash headsep} + \text{\textbackslash textheight} \\ & + \text{\textbackslash footskip} + B_{BM} + \Delta Y\end{aligned}$$

also (same as right-hand page):

$$1" + \text{\textbackslash voffset} + \text{\textbackslash topmargin} = B_{TM} + \Delta Y$$

These equations allow us to calculate LaTeX's parameters from the basic book design!



Summary: Equations for LaTeX page layout

Left-hand page:

For the width:

$$\begin{aligned}\text{\pdfpagewidth} = 1" + \text{\hoffset} \\ + \text{\evensidemargin} \\ + \text{\textwidth} + B_{IM} + \Delta X\end{aligned}$$

also:

$$\begin{aligned}1" + \text{\hoffset} + \text{\evensidemargin} = \\ \Delta X + B_{OM} + \text{\marginparwidth} + \text{\marginparsep}\end{aligned}$$

For the height:

$$\begin{aligned}\text{\pdfpageheight} = 1" + \text{\voffset} \\ + \text{\topmargin} + \text{\headheight} \\ + \text{\headsep} + \text{\textheight} \\ + \text{\footskip} + B_{BM} + \Delta Y\end{aligned}$$

also:

$$1" + \text{\voffset} + \text{\topmargin} = B_{TM} + \Delta Y$$

Right-hand page:

For the width:

$$\begin{aligned}\text{\pdfpagewidth} = 1" + \text{\hoffset} \\ + \text{\oddsidemargin} \\ + \text{\textwidth} + \text{\marginparsep} \\ + \text{\marginparwidth} + B_{OM} + \Delta X\end{aligned}$$

also:

$$1" + \text{\hoffset} + \text{\oddsidemargin} = B_{IM} + \Delta X$$

For the height:

$$\begin{aligned}\text{\pdfpageheight} = 1" + \text{\voffset} \\ + \text{\topmargin} + \text{\headheight} \\ + \text{\headsep} + \text{\textheight} \\ + \text{\footskip} + B_{BM} + \Delta Y\end{aligned}$$

also:

$$1" + \text{\voffset} + \text{\topmargin} = B_{TM} + \Delta Y$$

B_{TM} = book top margin

B_{BM} = book bottom margin

B_{OM} = book outside margin

B_{IM} = book inner margin

$\Delta X = \frac{1}{2}(\text{\pdfpagewidth} - \text{book-page-width})$

$\Delta Y = \frac{1}{2}(\text{\pdfpageheight} - \text{book-page-height})$