# Introduction to LaTeX

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# A powerful Typesetting system

```
A \textbf{bold
\textit{Hello \LaTeX}}
to start!
```

A **bold Hello** LaTeX to start !

```
Odds=$\left(\frac{\pi}{1-\pi}
\right)$
```

$$\text{Odds}=\left(\frac{\pi}{1-\pi}\right)$$

1. Input for LaTeX is composed in plain `ASCII` using a text editor
2. Although Word is useful for writing very short and simple documents, it becomes too complex or even unusable for more complicated tasks
3. Commonly needed features, like user-customized automated numbering or various automated indexes, cannot be created using Word at all
4. LaTeX does require more effort and time to learn to use even for simpler tasks, but once learned, difficult tasks can be accomplished rather easily and straightforwardly

# What is ASCII?

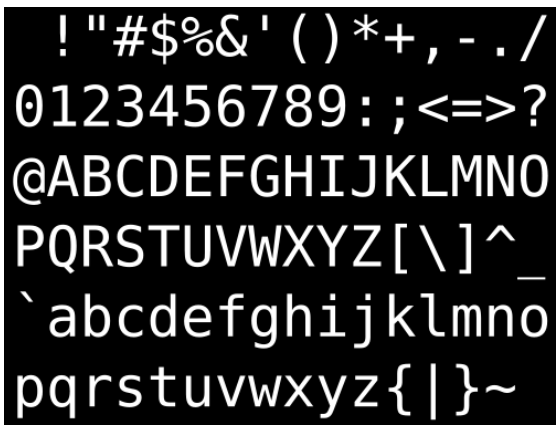


Figure 1: 95 printable ASCII characters, numbered 32 to 126. (0 to 31 & 127 are non-printing control characters)

1. When you save your document, it is saved in the form of plain text i.e in "ASCII" (the American Standard Code for Information Interchange)
2. ASCII is composed of 128 ($2^7$) characters: 7 binary digits for its encoding (Fig. **??**)
3. An ASCII message will be understandable by any computer in the world. If you send such a message, you can be sure that the recipient will see precisely what you typed

# What is ASCII?

4. By contrast, when you save a file from a word processor, the file contains various control characters, outside of the ASCII range. These characters represent the formatting that you applied (e.g. boldface or italics) plus various sorts of internal "business" relating to the mechanics of the word processor
5. They are not universally understandable: to make sense of them, you need a copy of the word processor with which the document was created
6. If you open a word processor file in a text editor, you will see (besides the text, or bits of it) a lot of funny looking stuff: this is the binary formatting code.

# Comparison

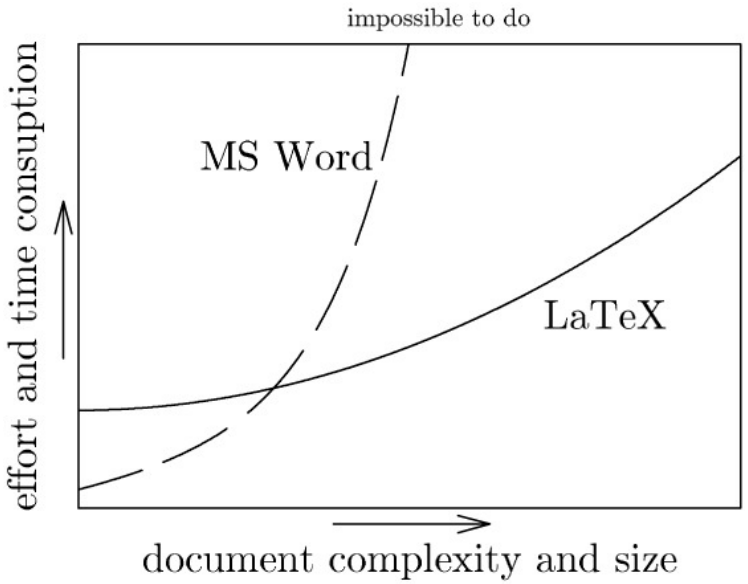


Figure 2: Comparison

- LaTeX has a greater learning curve
- Many tasks are very tedious or impossible (most cases) to do in MS Word or Libre Office

# The Philosophy behind LaTeX

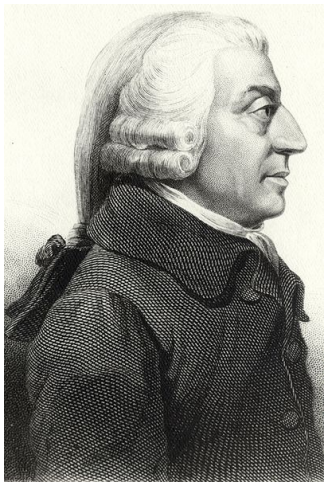

Figure 3: Adam Smith, author of *The Wealth of Nations* (1776), in which he conceptualizes the notion of the division of labour

## Division of Labour

Composition and logical structuring of text is the author's specific contribution to the production of a printed text. Matters such as the choice of the font family, should section headings be in bold face or small capitals? Should they be flush left or centered? Should the text be justified or not? Should the notes appear at the foot of the page or at the end? Should the text be set in one column or two? and so on, is the typesetter's business

# The Philosophy behind LaTeX

**Problems with "What you see is what you get" (WYSIWYG) editors such as MS Word and LibreOffice**

1. Author is distracted from the proper business of composing text, in favour of making typographical choices in relation to which they may have no expertise i.e. fiddling with fonts and margins when they should be concentrating on content
2. Making changes to the whole document i.e. section headings, numbering of figures, references and tables is tedious
3. Does not encourage concern with document structure

# Many Reasons to use LaTeX

- The typesetting of mathematical formulae is supported in a convenient way
- Users only need to learn a few easy-to-understand commands that specify the logical structure of a document. They almost never need to tinker with the actual layout of the document
- Even complex structures such as footnotes, references, table of contents, and bibliographies can be generated easily.
- LaTeX encourages authors to write well-structured texts, because this is how LaTeX works: by specifying structure
- TeX, the formatting engine of LaTeX $2_\varepsilon$, is highly portable and free. Therefore the system runs on almost any hardware platform available

# The Genius Behind LaTeX

The TeX project was started in 1978 by Donald E. Knuth (University of Stanford), while revising the second volume of his *Art of Computer Programming*. He saw that the publisher had switched to a new digital typesetting system and was shocked at the poor quality.

Figure 4: Donald E. Knuth

He reasoned that because digital typesetting meant arranging 1's and 0's in the proper pattern, as a computer scientist he should be able to do the job better. He originally estimated that this would take six months but ultimately it took nearly ten years. He had to handle not only the challenges of routine typesetting such as right-justification and page formatting flexible enough to allow for different output styles, but also the additional demands of academic publishing  footnotes, floating figures and tables, etc. And, beyond that, he had to tell the computer how to typeset formulas and other technical materials.

```
# create some random numbers
(x = rnorm(20))
```

```
##  [1]  0.14496  0.43832  0.15319  1.08494  1.99954 -0.81188
##  [7]  0.16027  0.58589  0.36009 -0.02531  0.15088  0.11008
## [13]  1.35968 -0.32699 -0.71638  1.80977  0.50840 -0.52746
## [19]  0.13272 -0.15594
```

```
mean(x)
```

```
## [1] 0.3217
```

```
var(x)
```

```
## [1] 0.5715
```

# References I


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