



# Quick Start

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# Introduction

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**1982** T<sub>E</sub>X is developed by *Donald Knuth*<sup>1</sup> in 1982 in order to type his acclaimed series of books on computer programming *Art of Computer Programming*.

**1985** Leslie Lamport extend the T<sub>E</sub>X system so it will be easy to create books, article etc. This is called L<sup>A</sup>T<sub>E</sub>X.

**1993** Second edition of L<sup>A</sup>T<sub>E</sub>X is launched, it is called L<sup>A</sup>T<sub>E</sub>X2<sub>ε</sub> which is mostly used now a days.

**Future** L<sup>A</sup>T<sub>E</sub>X3<sub>ε</sub> is under from long time development.

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<sup>1</sup>[https://en.wikipedia.org/wiki/Donald\\_Knuth](https://en.wikipedia.org/wiki/Donald_Knuth)

Pros:

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- Large Document

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- Different types of Environment

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- Publication Quality



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- Automation

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- Easy to Convert to Other Format

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- Difficult to Edit

## Quick Start

---

**Source  $\Rightarrow$  Output**

Prelims	{	<code>\documentclass{...}</code>
		<code>...</code>
		<code>\begin{document}</code>
Content	{	<code>...</code>
		<code>\end{document}</code>

**Table 1:** Global Structure of  $\text{\LaTeX}$  Source File

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<sup>2</sup>[https://en.wikibooks.org/wiki/LaTeX/Document\\_Structure](https://en.wikibooks.org/wiki/LaTeX/Document_Structure)



# Document Sectioning<sup>3 4</sup>

There are up to 7 levels of depth for defining sections depending on the document class:

- `\part{part}`
- `\chapter{chapter}`
- `\section{section}`
- `\subsection{subsection}`
- `\subsubsection{subsubsection}`
- `\paragraph{paragraph}`
- `\subparagraph{subparagraph}`

**Note:** To get a unnumbered section use `\section*{section}`, similarly to get an unnumbered subsection use `\subsection*{subsection}`.

---

<sup>3</sup>[https://www.sharelatex.com/learn/Sections\\_and\\_chapters](https://www.sharelatex.com/learn/Sections_and_chapters)

<sup>4</sup><http://www.ctex.org/documents/packages/layout/titlesec.pdf>

## Text Mode

---

Regular

`\textit{Italic}`

`\underline{underline}`

`\textsc{SmallCaps}`

`\textbf{Bold}`

`\textbf{\textit{ Bold Italic }}`

`\textbf{\textsc{ Bold SmallCaps }}`

Regular

*Italic*

underline

SMALLCAPS

**Bold**

**Bold Italic**

**Bold SmallCaps**

---

<sup>5</sup><https://en.wikibooks.org/wiki/LaTeX/Fonts>

<sup>6</sup>[https://www.sharelatex.com/learn/Font\\_sizes,\\_families,\\_and\\_styles](https://www.sharelatex.com/learn/Font_sizes,_families,_and_styles)

- `\begin{flushleft} ... \end{flushleft}` (Default)
- `\begin{flushright} ... \end{flushright}`
- `\begin{center} ... \end{center}`

**Munger** is a twin city and a Municipal Corporation situated in the Indian state of Bihar. It is the administrative headquarters of Munger district and Munger Division. It is the fifth largest city of Bihar and second largest city in Eastern Bihar.

Historically, Munger is known for being an ancient seat of rule. The twin city comprises Munger and Jamalpur situated on the southern bank of the river Ganges. It is situated 60 km west of Bhagalpur, and 180 km east of capital city Patna. (Source: Wikipedia)

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<sup>7</sup>[https://www.sharelatex.com/learn/Text\\_alignment](https://www.sharelatex.com/learn/Text_alignment)

## Manual breaks <sup>8</sup>

<code>\newline</code>	Breaks the line at the point of the command.
<code>\\</code>	Breaks the line at the point of the command, it is usually a shorter version of the previous command.
<code>\\*</code>	Breaks the line at the point of the command and also prohibits a page break after the forced line break.
<code>\\[extra-space]</code>	Extra vertical space to be inserted before the next line. This amount can be negative.
<code>\par (TeX)</code>	Starts a new paragraph.
<code>\newpage</code>	Starts a new page.

---

<sup>8</sup>[https://en.wikibooks.org/wiki/LaTeX/Paragraph\\_Formatting#Manual\\_breaks](https://en.wikibooks.org/wiki/LaTeX/Paragraph_Formatting#Manual_breaks)

# Lists

## Unordered List

```
\begin{itemize}  
  \item Milk  
  \item Eggs  
  \item Potatoes  
\end{itemize}
```

- Milk
- Eggs
- Potatoes

## Enumerations

```
\begin{enumerate}  
  \item First  
  \item Second  
  \item Last  
\end{enumerate}
```

1. First
2. Second
3. Last

## Description

```
\begin{description}  
  \item[Ram] One  
  \item[Shyam] Two  
  \item[Mohan] Three  
\end{description}
```

**Ram** One  
**Shyam** Two  
**Mohan** Three

```
\begin{tabular}{l c r }
  1 & 2 & 3 \\
  4 & 5 & 6 \\
  7 & 8 & 9 \\
\end{tabular}
```

1	2	3
4	5	6
7	8	9

```
\begin{tabular}{l | c r |}
  1 & 2 & 3 \\
  4 & 5 & 6 \\
  7 & 8 & 9 \\
\end{tabular}
```

1	2	3
4	5	6
7	8	9

---

<sup>9</sup><https://en.wikibooks.org/wiki/LaTeX/Tables>

<sup>10</sup><https://www.sharelatex.com/learn/Tables>

- h where the table is declared (here)
- t at the top of the page
- b at the bottom of the page
- p on a dedicated page of floats
- ! override the default float restrictions. E.g., the maximum size allowed of a b float is normally quite small; if you want a large one, you need this ! parameter as well.

**Note:** Default is `tbp`. If you want a table at the position it is specified, you should use `h!`.

---

<sup>11</sup>[https://en.wikibooks.org/wiki/LaTeX/Tables#Floating\\_with\\_table](https://en.wikibooks.org/wiki/LaTeX/Tables#Floating_with_table)



To include a figure in  $\text{\LaTeX}$  we have to use **graphicx** package, and a figure in .eps, .png or .pdf format is added using `\includegraphics`. Some uses are as follows:

- `\includegraphics{filename}` Simple Use

---

<sup>12</sup>[https://www.sharelatex.com/learn/Inserting\\_Images](https://www.sharelatex.com/learn/Inserting_Images)

<sup>13</sup>[https://en.wikibooks.org/wiki/LaTeX/Importing\\_Graphics](https://en.wikibooks.org/wiki/LaTeX/Importing_Graphics)

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- `\includegraphics{filename}` Simple Use
- `\includegraphics[scale=1.5]{filename}` Scale the figure by factor of 1.5

---

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To include a figure in  $\text{\LaTeX}$  we have to use **graphicx** package, and a figure in .eps, .png or .pdf format is added using `\includegraphics`. Some uses are as follows:

- `\includegraphics{filename}` Simple Use
- `\includegraphics[scale=1.5]{filename}` Scale the figure by factor of 1.5
- `\includegraphics[width=3cm, height=4cm]{filename}`  
Specific height and width of figure

---

<sup>12</sup>[https://www.sharelatex.com/learn/Inserting\\_Images](https://www.sharelatex.com/learn/Inserting_Images)

<sup>13</sup>[https://en.wikibooks.org/wiki/LaTeX/Importing\\_Graphics](https://en.wikibooks.org/wiki/LaTeX/Importing_Graphics)

To include a figure in  $\text{\LaTeX}$  we have to use **graphicx** package, and a figure in .eps, .png or .pdf format is added using `\includegraphics`. Some uses are as follows:

- `\includegraphics{filename}` Simple Use
- `\includegraphics[scale=1.5]{filename}` Scale the figure by factor of 1.5
- `\includegraphics[width=3cm, height=4cm]{filename}`  
Specific height and width of figure
- `\includegraphics[width=\textwidth]{universe}` Width same as document

---

<sup>12</sup>[https://www.sharelatex.com/learn/Inserting\\_Images](https://www.sharelatex.com/learn/Inserting_Images)

<sup>13</sup>[https://en.wikibooks.org/wiki/LaTeX/Importing\\_Graphics](https://en.wikibooks.org/wiki/LaTeX/Importing_Graphics)

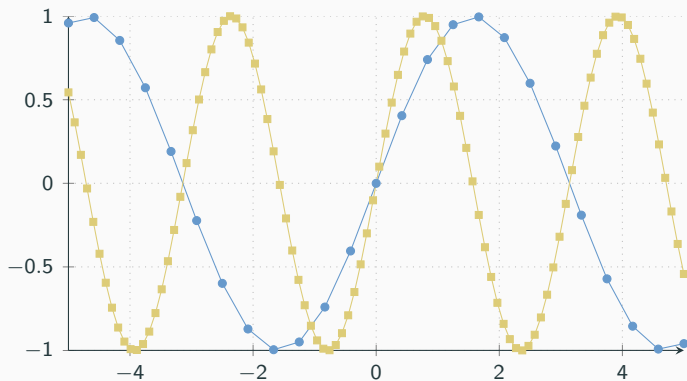
# Example

```
\begin{figure}[h]  
  \centering  
  \includegraphics[height=3cm]{images/munger-pic}  
  \caption{A picture of munger}  
\end{figure}
```

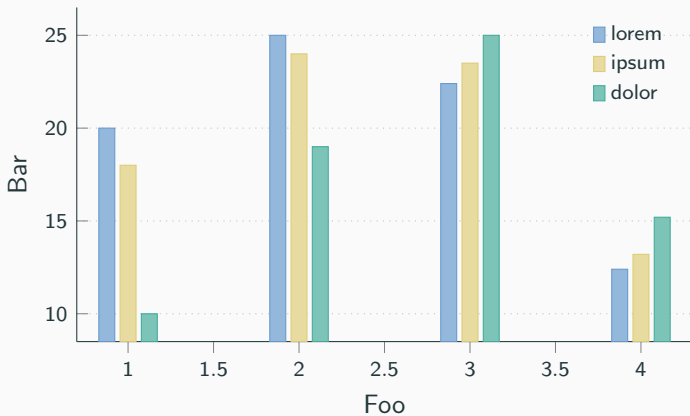


**Figure 1:** A picture of munger

## Example – Line plots



## Example – Bar charts



```
\begin{quote}  
  Young man, in mathematics you don't understand things.  
  You just get used to them.\\  
  \hfill --- \textup{John Von Neumann}  
\end{quote}
```

*Young man, in mathematics you don't understand things. You  
just get used to them.*

— John Von Neumann



# Quotation

```
\begin{quotation}  
  Young man, in mathematics you don't understand things.  
  You just get used to them.\\  
  \hfill --- \textup{John Von Neumann}  
\end{quotation}
```

*Young man, in mathematics you don't understand things.  
You just get used to them.*

— John Von Neumann

# Math Mode

---

- Inline Expression
  - `$ ... $` or `\( ... \)`
  - Mixed with text.

---

<sup>14</sup><http://reu.dimacs.rutgers.edu/Symbols.pdf>

<sup>15</sup><https://en.wikibooks.org/wiki/LaTeX/Mathematics>

<sup>16</sup>[https://www.sharelatex.com/learn/Mathematical\\_expressions](https://www.sharelatex.com/learn/Mathematical_expressions)

<sup>17</sup><http://www.math.hkbu.edu.hk/TeX/short-math-guide.pdf>

- Inline Expression
  - $\$ \dots \$$  or  $\backslash( \dots \backslash)$
  - Mixed with text.
- Display Style
  - Untagged:  $\$ \$ \dots \$ \$$  or  $\backslash[ \dots \backslash]$
  - Tagged:  $\backslashbegin\{ equation \} \dots \backslashend\{ equation \}$

---

<sup>14</sup><http://reu.dimacs.rutgers.edu/Symbols.pdf>

<sup>15</sup><https://en.wikibooks.org/wiki/LaTeX/Mathematics>

<sup>16</sup>[https://www.sharelatex.com/learn/Mathematical\\_expressions](https://www.sharelatex.com/learn/Mathematical_expressions)

<sup>17</sup><http://www.math.hkbu.edu.hk/TeX/short-math-guide.pdf>

- Inline Expression
  - `$ ... $` or `\( ... \)`
  - Mixed with text.
- Display Style
  - Untagged: `$$ ... $$` or `\[ ... \]`
  - Tagged: `\begin{ equation } ... \end{ equation }`
- A Set of Equation
  - $\mathcal{AMS-LAT}_{E}X$ : align, aligned
  - `mathtools`: gather
  - `equarray`: eqnarray

---

<sup>14</sup><http://reu.dimacs.rutgers.edu/Symbols.pdf>

<sup>15</sup><https://en.wikibooks.org/wiki/LaTeX/Mathematics>

<sup>16</sup>[https://www.sharelatex.com/learn/Mathematical\\_expressions](https://www.sharelatex.com/learn/Mathematical_expressions)

<sup>17</sup><http://www.math.hkbu.edu.hk/TeX/short-math-guide.pdf>

## Example

This is an inline equation  $(x^2 + y^2 = z^2)$ . The following equation is in "Display Style".

$$[ x^n + y^n = z^n ]$$

The following equation is numbered.

$$\begin{equation} x^n + y^n = z^n \end{equation}$$



This is an inline equation  $x^2 + y^2 = z^2$ . The following equation is in "Display Style".

$$x^n + y^n = z^n$$

The following equation is numbered.

$$x^n + y^n = z^n \tag{1}$$

## Example - Set of Equation

```
\begin{align*}
f(x) &= a x^2+b x +c & g(x) &= d x^3 \\
f'(x) &= 2 a x +b & g'(x) &= 3 d x^2
\end{align*}
```

## Example - Set of Equation

```
\begin{align*}f(x) &= a x^2 + b x + c & g(x) &= d x^3 \\f'(x) &= 2 a x + b & g'(x) &= 3 d x^2\end{align*}
```

↓

$$f(x) = ax^2 + bx + c$$

$$f'(x) = 2ax + b$$

$$g(x) = dx^3$$

$$g'(x) = 3dx^2$$



# Matrices

Although matrices can be print using tabular enviroment. But there are some predefined matrices in  $\mathcal{AMS}$ - $\text{\LaTeX}$ .

```
\begin{pmatrix}
a & b \\
c & d
\end{pmatrix}
```

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

Although matrices can be print using tabular enviroment. But there are some predefined matrices in  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ .

```
\begin{bmatrix}
a & b \\
c & d
\end{bmatrix}
```

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

Although matrices can be print using tabular enviroment. But there are some predefined matrices in  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ .

```
\begin{vmatrix}
a & b \\
c & d
\end{vmatrix}
```

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix}$$

# Matrices

Although matrices can be print using tabular enviroment. But there are some predefined matrices in  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ .

```
\begin{Vmatrix}  
a & b \\  
c & d  
\end{Vmatrix}
```

$$\left\| \begin{array}{cc} a & b \\ c & d \end{array} \right\|$$

```
f(x) =  
  \begin{cases}  
    1      & \text{if } x \in \mathbb{Q} \\  
    0      & \text{else }  
  \end{cases}
```



$$f(x) = \begin{cases} 1 & \text{if } x \in \mathbb{Q} \\ 0 & \text{if else} \end{cases}$$

# **Advance Mathematics**

---

# Custom Operator

A custom operator like  $\sin(x)$ , use `\DeclareMathOperator` command in preamble or `\operatorname` in document itself.

`\operatorname{E}[x]`

$E[X] = E[X]$

`\operatorname{arg\,max}_a f(a)`     $\arg \max_a f(a)$

To get a operator like `\lim`, either use `\DeclareMathOperator*` or `\operatorname*` command, for example

`\operatorname{foo}_a f(a) = \operatorname*{foo}_b f(b)`

$\operatorname{foo}_a f(a) = \operatorname{foo}_b f(b)$

# Whitespace in Math Mode

`\quad` space equal to the current font size ( $= 18 \text{ mu}$ )

`\,`  $3/18$  of `\quad` ( $= 3 \text{ mu}$ )

`\:`  $4/18$  of `\quad` ( $= 4 \text{ mu}$ )

`\;`  $5/18$  of `\quad` ( $= 5 \text{ mu}$ )

`\!`  $-3/18$  of `\quad` ( $= -3 \text{ mu}$ )

`\` equivalent of space in normal text

`\qquad` twice of `\quad` ( $= 36 \text{ mu}$ )



Another way to make whitespace is to make something invisible. We can use `\phantom` command to make something invisible in math mode.

```
\begin{pmatrix} -1 & -2 \\ 2 & 1 \end{pmatrix} =  
\begin{pmatrix} -1 & -2 \\ \phantom{-}2 & \phantom{-}1 \end{pmatrix}
```

$$\begin{pmatrix} -1 & -2 \\ 2 & 1 \end{pmatrix} = \begin{pmatrix} -1 & -2 \\ 2 & 1 \end{pmatrix}$$

# Left and Right Delimiter

Proper size of paranthesis is obtained using `\left` and `\right` delimiter

```
\{  
\begin{pmatrix} 1 \\ n \end{pmatrix} | n \in \mathbb{N}  
\} = \left \{  
\begin{pmatrix} 1 \\ n \end{pmatrix} | n \in \mathbb{N}  
\right \}
```

$$\left\{ \begin{pmatrix} 1 \\ n \end{pmatrix} \mid n \in \mathbb{N} \right\} = \left\{ \begin{pmatrix} 1 \\ n \end{pmatrix} \mid n \in \mathbb{N} \right\}$$

**More to Explore**

---

- custom command
- hyperref
- bibliography
- index
- beamer
- etc.

**Questions?**

**Thank You?**

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