

# Astrocamp: Brief Guide to LaTeX

Astrocamp

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# Introduction to LaTeX

OverLeaf Getting Started, we recommend you use OverLeaf as manual installation of LaTeX gets pretty involved.

- 1 Create a new account with [OverLeaf](#)
- 2 Create a new project and copy the Astrocamp Template
- 3 Press menu and select TeX Live Version to be 2021
- 4 Your file should now compile!

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# Typesetting and Math

Typesetting and Math Commands can be used with the backlash `\`.  
To get a new line, we need to use two backslashes `\\`

Some generally useful commands:

```
\textbf{text} % Bolding Text  
\textit{text} % Italicised Text  
\textcolor{color}{text} % Coloured Text  
\href{link}{name of link} % Create Hyperlinks
```

We can create unordered list by using itemize:

- First Ele
- Second Ele
- Third Ele

```
\begin{itemize}  
  \item First Ele  
  \item Second Ele  
  \item Third Ele  
\end{itemize}
```

or we can create ordered list using enumerate:

- ❶ First Ele
- ❷ Second Ele
- ❸ Third Ele

```
\begin{enumerate}  
  \item First Ele  
  \item Second Ele  
  \item Third Ele  
\end{enumerate}
```

Examples of mathematical symbols

`$\pi, \alpha \log(\beta)$`

will yield:  $\pi, \alpha \log(\beta)$



For inline equations, like  $a^2 + b^2 + c^2$ , we use one \$:

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

For equations that span a few lines, we use align (there are multiple ways but this way is the most general way):

```
\begin{align*}
\frac{r^3}{T^2} &= \frac{GM}{4\pi^2} \\
a^2 + b^2 &= c^2 \\
F_g &= \frac{GM}{r^2}
\end{align*}
```

will create the following:

$$\begin{aligned} \frac{r^3}{T^2} &= \frac{GM}{4\pi^2} \\ a^2 + b^2 &= c^2 \\ F_g &= \frac{GM}{r^2} \end{aligned}$$

Note the use of `\\` to get a new line. We use `&` to ensure the equations line up at the equals sign

To define custom equations, define them at the top of the page like so:

```
\newcommand{\name_of_command}[number_of_variables]{custom_command}  
\newcommand{\pyth}[3]{$#1 + #2 + #3$}
```

We can then call these commands by writing

```
\pyth{a}{b}{c}
```

which outputs  $a + b + c$

## Task:

- 1 Recreate the following equation:

$$M_{\odot} = 1.99 \times 10^{30} \text{ kg}$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$B_{\nu} = \frac{2h\nu^3}{c^2} \frac{1}{\exp(h\nu/kT) - 1}$$

- 2 Define a custom command that automatically gives you the relative abundance between two elements:

```
\abundance{Fe}{H}
\abundance{C}{N}
```

should output  $\left[ \frac{Fe}{H} \right]$  and  $\left[ \frac{C}{N} \right]$

- 3 List out steps to your daily commute using an ordered list

Solution:

- 1 Recreate the following equation:

```
M_\odot = 1.99 \times 10^{30} \text{ kg} \\
\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \\
B_\nu = \frac{2h \nu^3}{c^2} \frac{1}{\exp(h \nu / kT) - 1}
```

- 2 Define a custom command that differentiates a variable for you:

```
\newcommand{\abundance}[2]{$\text{Big}[\frac{\text{\#1}}{\text{\#2}}]\text{Big}$}
```

- 3 Daily Commute

```
\begin{enumerate}
  \item Don't have coffee
  \item Ded
\end{enumerate}
```

# Figures

## Figure Example



Figures/AGBProof.png

**Figure 1:** Verifying whether low stars are AGB stars. Orange data points are for low red giants while the blue data points consist of all the stars in the APOGEE data set. The orange spots that are above the main group of stars are potential AGB stars.

FYI: the label command can be used just to mark some arbitrary place (e.g. you can label a section or a paragraph if you want to cite them later).

## Structure of a figure

```
\begin{figure}
  \centering
  \includegraphics[additional commands]{location of figure}
  \caption{random text}
  \label{label can be used to reference image}
\end{figure}
```

The figure on the previous slide uses:

```
\begin{figure}
  \centering
  \includegraphics[width=\columnwidth/3]{Figures/AGBProof.png}
  \caption{Verifying whether low \CN stars are AGB stars...}
  \label{fig:AGB_PROOF}
\end{figure}
```

We can reference the figure 1 now that its labeled using:

```
\ref{fig:AGB_PROOF}
```

## Task:

- Include JWST image
  - Make sure it fits
  - Include a caption
  - Label it something sensible and reference it

Solution:

```
\begin{figure}
  \centering
  \includegraphics[width=\columnwidth]{photos/jwst.jpg}
  \caption{coolio spaghetti}
  \label{jswt}
\end{figure}
```

Figure \ref{jswt}



# Bibliograph

In your research folder, there should be a .bib files where you put your bibliography.

- When you cite any of the articles in your .bib file, it should automatically be included in your citations at the bottom of your document
- To cite any article, simply write (there should be some citations you can use in the template)

```
\cite{citation}
```

```
\cite{Martell02}
```

To add another citation, simply export citation from your source of choice and add to the .bib file.

Make sure that it is in the form BibTeX.

It should look something like this ( P.S. you can change the 2023MNRAS.523LL..80B part (this is an alias, so we can change it to make it easier to recognise, e.g. Kirsten23) P.S.S your articles maybe different as there are many more fields

```
@ARTICLE{2023MNRAS.523L..80B,
  author = {{Banks}, Kirsten A. and {Ho}, ...}
  title = "{CN and CO features: ...}",
  journal = {\mnras},
  keywords = {asteroseismology, stars: evolution, ...},
  ...
}
```

Task:

- Find a new citation of ADS and add it to your document
- Cite it and find it in your bottom of your compiled PDF

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Here is an example of how you can format a research paper

- ➊ Abstract
- ➋ Introduction
- ➌ Literature Review/Necessary Background Knowledge
- ➍ Method
- ➎ Results
- ➏ Discussion
- ➐ Conclusion
- ➑ Ideas for Future Research

# Research Paper Structure

## Research Advice:

- Start your report early and do it as you go (keep track of your sources add to your bibliography periodically)
- Schedule time so you can focus on the research (you will most definitely have a few days - few weeks where you have no idea what you are doing) (the hardest part is starting)

## Task:

- Get started with creating a research document
  - For those in groups, one person should create a document and share it
  - Get peoples infos/make a slack group where you can share ideas and plan things out