

CAMTEX

INSTRUCTIONAL REFERENCE



Workshop 3

CAMT_EX Workshop 3 — Instructional Reference

1 Floats

1.1 What is a Float?

Floats may be thought of as “floating” containers containing content, which L^AT_EX will attempt to intelligently place somewhere, depending on the surrounding content and the user-supplied *placement specifier*. The floats most used are `table` (for tables) and `figure` (everything else, most commonly images), declared as such:

```
\begin{figure}[placement specifier]
  \centering
  ... figure contents ...
  \caption{Caption goes here.}
  \label{fig:label-goes-here}
\end{figure}
```

Floats may not be broken over pages. Floats can have captions, which can be labelled and referenced (more on that later). By default, text cannot wrap around a float, but there are packages that allow that to be achieved.

1.2 Placement Specifiers

The placement specifier tells L^AT_EX where to place the float, there are several built in, and some that require extra packages. Most common are:

- `h`: here, same point as in source code.
- `t`: top of page.
- `b`: bottom of page.
- `p`: on a special separate float page. Multiple `p` floats will be batched into float pages, which will be inserted between normal pages as L^AT_EX deems appropriate.
- `H`: equivalent to `h`, but forces it to not be overridden. Requires the `float` package.
- `!`: a **modifier** that prevents overriding. e.g. `\begin{figure}[h!]`

It is important to note that placement specifiers are suggestions to the compiler, and if it thinks your suggestion is stupid then it can and will ignore it. (Typically, `h` is defaulted to `t`.) The `!` modifier only makes the suggestion stronger, not absolute. The only way to force an `h` is to import the `float` package and use `H`.

Since placement specifiers are suggestions, they can be chained as fallbacks. Specifying `\begin{figure}[hb]` asks the compiler to do `h`, then `b` if that isn’t possible.

1.3 Including Images

To include an image, the image file must first be placed within your project directory. On Overleaf, the image file must be uploaded to the project. The image may then be simply inserted with the `\includegraphics[optional-arguments-here]{file-path-here}`, where optional arguments may include

- `width=<length>`, replacing length with a measurement such as `10em`, `6cm`, or `0.7\textrm{width}` (the last one does what you expect. `\ linewidth` and `\textrm{width}` are very similar, look up the difference if you really care.);

- `height=<length>`; or
- `scale=<factor>`, where the factor is a dimensionless scale factor from what would have been shown with no optional argument.

The resultant image of the command by itself is shown inline like this, , which is why we don't use the command by itself. It is typically wrapped in a figure environment:

```
\begin{figure}[H]
  \centering
  \includegraphics[width=0.5\linewidth]{images/float_dog.jpg}
  \caption{‘‘DSC\_8964’’ by Kent MacElwee is licensed under CC BY-NC-ND 2.0}
  \label{fig:dog}
\end{figure}
```



Figure 1: “DSC_8964” by Kent MacElwee is licensed under CC BY-NC-ND 2.0

1.4 Types of Floats: Tables, Subfloats and Text Wrapping

1.4.1 Difference between Figures and Tables

The most common types of floats are tables and figures. They are functionally identical, except table captions will start with “Table X:”, and figure captions will start with “Figure Y:”. They run on separate numbering counters.

1	2	3
4	5	6
7	8	9

Table 1: This is the table caption.

```
\begin{table}[H]
  \centering
  \begin{tabular}{|c|c|c|}
    ...
  \end{tabular}
  \caption{This is the table caption.}
  \label{tab:table_1}
\end{table}
```

Similar to generating a table of contents, a list of figures may be created with the command `\listoffigures`, and a list of tables with `\listoftables`.

1.4.2 Subfloats

The `subcaption` package provides subfigures and subtables (i.e. subfloats), which allow side-by-side sub-entries in a table or figure.



(a) Each subfloat has a label and caption.

```
\begin{figure}[h]
\centering
\begin{subfigure}[b]{0.4\textwidth}
\includegraphics[width=\textwidth]{...}
\caption{Each subfigure has its...}
\label{fig:subfig-eg-left}
\end{subfigure}
\hskip{2em}
\begin{subfigure}[b]{0.4\textwidth}
...
\caption{This is the source.}
\label{fig:subfig-eg-right}
\end{subfigure}
\caption{...}
\label{fig:subfig-eg}
\end{figure}
```

(b) The source for this figure.

Figure 2: There is also an overall figure label and caption.

There are several key things to note here:

- Each subfloat must have a specified width. Within the subfloat, `\textwidth` is redefined as that subfloat's internal width, making it easier to size e.g. `includegraphics`.
- The horizontal space between subfloats may be adjusted by simply inserting spaces between them, as `\hskip{}` was used above.
- Subfloats are aligned at the caption, leading to a jagged top if there is a height mismatch.

1.4.3 Text Wrapping

Normal figures span the width of the page. For text wrapping, use the `wrapfig` package, which provides the command `\begin{wrapfigure}[lineheight]{position}{overhang}{width}`.

- `lineheight`: the (dimensionless) number of lines the figure is tall. Automatically estimated if no argument is given.
- `position`: normally `r` or `l` (left or right), but `i` or `o` in a two-sided document (inner edge and outer edge). Can also use uppercase `R`, `L`, `I`, `O` to let the figure float.
- `overhang`: the dimensioned distance the figure overflows into the margins (default 0).
- `width`: the dimensioned width of the figure; self explanatory.

Some notes on wrapfigures:

- If `{0pt}` is given for the `width`, L^AT_EX will attempt to estimate the width of the wrapfigure.
- This may be why `\textwidth` is annoyingly still defined as the full-page text width inside a wrapfigure, so the `includegraphics` will require the correct shrink factor.
- By default, a healthy top and bottom margin are supplied to the contents of a wrapfigure. Negative spaces (e.g. `\vspace{-1cm}`) can be used to force compact wrapfigures.

Below is a wrapfigure with arguments `\begin{wrapfigure}{r}{0.35\textwidth}`, and an `\includegraphics[width=0.325\textwidth]{...}`. Remember the figure should be placed in the source *above* the text that should wrap around it

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Senectus et netus et malesuada fames ac turpis egestas maecenas. Sagittis id consectetur purus ut. (Wrapfigure inserted after here)

Eget nunc scelerisque viverra mauris. Ut pharetra sit amet aliquam id diam. Eu mi bibendum neque egestas congue quisque egestas diam. Malesuada proin libero nunc consequat interdum varius. Nulla aliquet enim tortor at auctor urna nunc. In hendrerit gravida rutrum quisque non. Sed id semper risus in hendrerit gravida rutrum. Vel pharetra vel turpis nunc eget lorem.

Quam lacus suspendisse faucibus interdum posuere lorem ipsum dolor sit. Fames ac turpis egestas integer eget aliquet nibh. Nunc pulvinar sapien et ligula ullamcorper.

Turpis massa tincidunt dui ut ornare lectus sit amet. Sed lectus vestibulum mattis ullamcorper velit sed ullamcorper. Lacus sed turpis tincidunt id. Etiam erat velit scelerisque in dictum non. Velit dignissim sodales ut eu. Posuere ac ut consequat semper viverra. Erat pellentesque adipiscing commodo elit.

1.5 Minipages

Minipages are not technically floats, but are very useful in document structuring. They allow placing content side-by-side in a more precise fashion than subfloats or multicolumns. The syntax is:

```
\begin{minipage}[adjustment]{width}
[...]
\end{minipage}
\begin{minipage}[adjustment]{width}
[...]
\end{minipage}
...
```

There must be no extra lines breaks between the ends and starts of minipages (breaks within are fine), as then they will be split into different “rows”. However, horizontal spacing commands such as `\quad` or `\hspace{}` to space out minipages are permissible.

While the `width` argument is self-explanatory; `adjustment` is more complicated. It can be `t`, `c` or `b`, and this causes the minipages to be aligned along their tops, centers and bottoms respectively. The below minipage sets are respectively `t`- , `c`- and `b`- aligned.

Senectus et netus et malesuada fames ac turpis egestas maecenas. Sagittis id consectetur purus ut.

Senectus et netus et malesuada fames ac turpis egestas maecenas. Sagittis id consectetur purus ut.

Senectus et netus et malesuada fames ac turpis egestas maecenas. Sagittis id consectetur purus ut.

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.



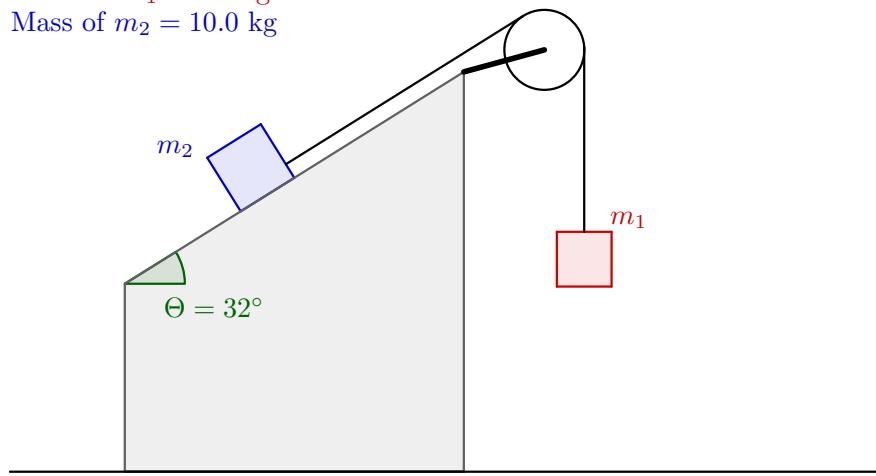
Figure 3: An example.

1.6 Geogebra

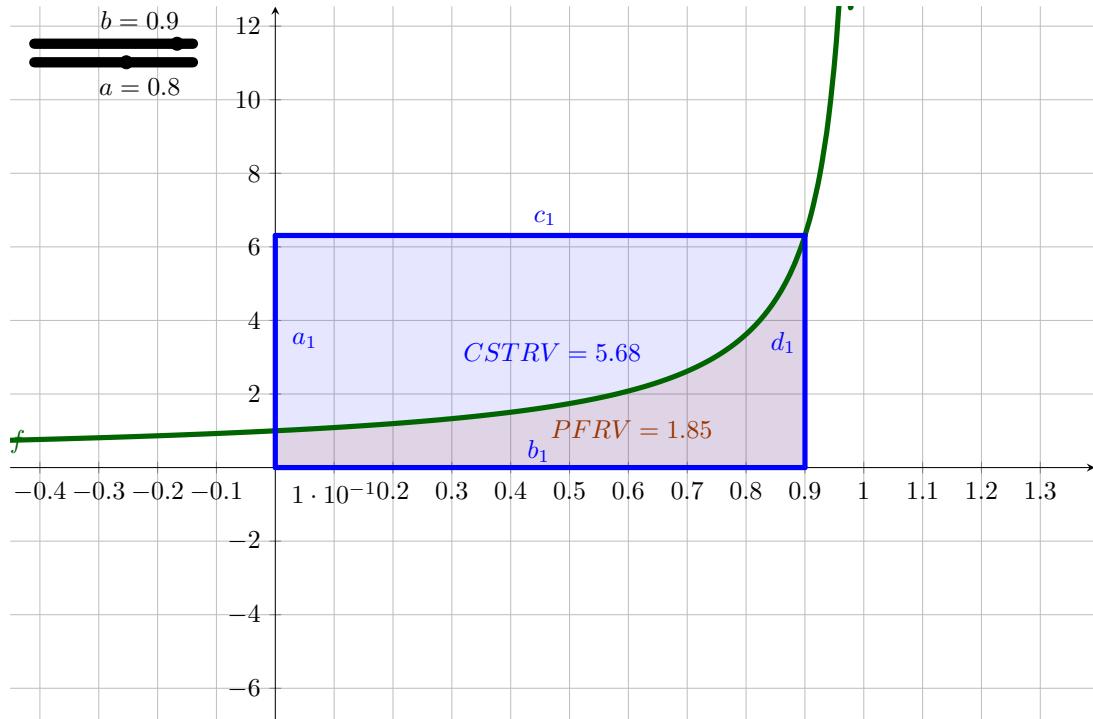
For those who have a Geogebra license on their computer, any GeoGebra diagram can be exported as a tikzpicture directly into the L^AT_EX document, without reducing quality by importing as an image. Within the Geogebra menus, there is an option to: Export - Graphics View as PGF/TiKZ. This produces a PGF latex picture format file with the code that can be pasted into the document. The tikz package, and the pgfplots packages are required for this functionality.

1.6.1 Mechanics

Mass of $m_1 = 7.5 \text{ kg}$
Mass of $m_2 = 10.0 \text{ kg}$



1.6.2 Chemical Engineering



2 Packages

Some common packages can be found in the table below. Some packages add new features; others override L^AT_EX presets or modify default behaviour to make your life easier. All packages can be added in the preamble using the `\usepackage{package}` command.

For extensive lists on package arguments see the package documentation from CTAN. (The website looks archaic and technical, but it's actually quite easy to use.)

Package	Description	Key Commands
comment	starts and ends comments	<code>\begin{comment} ... \end{comment}</code>
hyperref	shows url as clickable on pdf	<code>\href{[url]}{[display text]}</code>
hyphenat	enable / disable hyphenation	<code>\usepackage[none]{hyphenat}</code>
indentfirst	Indents the first paragraph after a section tag	-
lipsum	generates Lorem Ipsum text	<code>\lipsum</code>
microtype	magically makes everything look nicer	-
minted	Allows source code to be formatted in a chosen language	<code>\begin{minted}{[language]} ... \end{minted}</code>
nth	faster way of writing n th numbers	<code>\nth{[number]}</code>
parskip	No indentation; Space between paragraphs	-
pdfpages	Add pdf pages into the document	<code>\includepdf[pages={[page range]} {[pdf file]}]</code>
setspace	changes line spacing	<code>\singespacing, \doublespacing</code>
tcolorbox	Gives coloured textboxes	<code>\begin{tcolorbox}[arguments] ... \end{tcolorbox}</code>
url	shows hyperlinked url exactly as typed	<code>\url{[url]}</code>
wrapfig	produces figures which text can flow around	<code>\begin{wrapfigure} ... \end{wrapfigure}</code>

3 Multicolumns in Text

Multicolumns are extraordinarily easy to form and only require the multicol package.

```
\begin{multicols}{[number of columns]}\dots\end{multicols}
```

Exodus (14:21): “Then Moses stretched out his hand over the sea, and the Lord drove the sea back by a strong east wind all night and made the sea dry land, and the waters were divided.”

 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasel-

lus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

 Nam dui ligula, fringilla a, erat ligula aliquet magna, vi-
euismod sodales, sollicitudin tae ornare odio metus a mi.
vel, wisi. Morbi auctor lorem Morbi ac orci et nisl hendrerit
non justo. Nam lacus libero, mollis. Suspendisse ut massa.
pretium at, lobortis vitae, ul-
tricies et, tellus. Donec aliquet, Cras nec ante. Pellentesque a
tortor sed accumsan bibendum, nulla. Cum sociis natoque pe-
natibus et magnis dis parturi-

ent montes, nascetur ridiculus
mus. Aliquam tincidunt urna.
Nulla ullamcorper vestibulum
turpis. Pellentesque cursus luc-
tus mauris.

 Nulla malesuada iscing semper elit. Proin fermentum
porttitor diam. Donec felis erat, congue non, massa ac quam. Sed
volutpat at, tincidunt diam turpis, molestie
tristique, libero. Vi-
vamus viverra fer-
mentum felis. Donec
nonummy pellentesque
ante. Phasellus adip-

iscing semper elit. cipit a, ipsum. Morbi ismod nunc eu pu-
blandit ligula feugiat rus. Donec bibendum
magna. Nunc eleifend quam in tellus. Nul-
consequat lorem. Sed lam cursus pulvinar
lacinia nulla vitae lectus. Donec et mi.
vitae, placerat a, mo- enim. Pellentesque
lestie nec, leo. Mae- tincidunt purus vel
cenas lacinia. Nam magna. Integer non
ipsum ligula, eleifend enim. Praesent eu-
at, accumsan nec, sus- mass.

4 References

There are three main options in L^AT_EX for bibliography: bibtex, natbib and biblatex. Biblatex is modern and will be used in this course.

4.1 Bibliography Files

Bibliography files are sub files within the directory of the document. They use a different file extension, **.bib** rather than **.text**, and contain the information about the references. There is standard bibtex syntax, some of which will be shown below, though as with all referencing there are many different options available and so the instructions here will not be complete, rather a guide on how to structure with specific commands being found in the documentation.

e.g. within the bibliography file:

```
@article{einstein,
    author = "Albert Einstein",
    title = "{Zur Elektrodynamik bewegter K\"orper}. ({German})
              [{On} the electrodynamics of moving bodies]",
    journal = "Annalen der Physik",
    volume = "322",
    number = "10",
    pages = "891--921",
    year = "1905",
    doi = "http://dx.doi.org/10.1002/andp.19053221004",
    keywords = "physics"
}

@book{dirac,
    title = {The Principles of Quantum Mechanics},
    author = {Paul Adrien Maurice Dirac},
    isbn = {9780198520115},
    series = {International series of monographs on physics},
    year = {1981},
    publisher = {Clarendon Press},
    keywords = {physics}
}
```

These would be references with the labels einstein and dirac respectively, specified by the first argument in each.

4.2 Referencing to the Bibliography

Now that the information is stored within the document, it is only a case of referencing to it and printing the completed bibliography. To do so a mwe is included:

Citing a certain famous equation from Einstein[2] and one from Dirac too [1]. Citation styles can be modified by preamble commands, or by specification in-text such as with \supercite, like this². Biblatex can generate author-year citations and many others.

Here, we are citing another thing: [3].

References

- [1] Paul Adrien Maurice Dirac. *The Principles of Quantum Mechanics*. International series of monographs on physics. Clarendon Press, 1981. ISBN: 9780198520115.
- [2] Albert Einstein. “Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]”. In: *Annalen der Physik* 322.10 (1905), pp. 891–921. DOI: <http://dx.doi.org/10.1002/andp.19053221004>.
- [3] Donald E. Knuth. “Fundamental Algorithms”. In: Addison-Wesley, 1973. Chap. 1.2.

```
\usepackage{biblatex}
\addbibresource{physics.bib}

\begin{document}
Citing a certain famous equation from Einstein \cite{einstein}
and one from Dirac too \cite{dirac}.

\printbibliography

\end{document}
```

4.3 Displaying the Bibliography

To add the bibliography to the Table of Contents an extra argument is included in the command:

```
\printbibliography[
heading=bibintoc,
title={References (Again)}]
```

This includes the bibliography in the ToC and changes the printed title from References by default to Whole Bibliography.

References (Again)

- [1] Paul Adrien Maurice Dirac. *The Principles of Quantum Mechanics*. International series of monographs on physics. Clarendon Press, 1981. ISBN: 9780198520115.
- [2] Albert Einstein. “Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]”. In: *Annalen der Physik* 322.10 (1905), pp. 891–921. DOI: <http://dx.doi.org/10.1002/andp.19053221004>.
- [3] Donald E. Knuth. “Fundamental Algorithms”. In: Addison-Wesley, 1973. Chap. 1.2.

Useful further resources with a complete list of bibliography arguments can also be found on Overleaf’s own help pages.

4.4 Importing References

The most important thing to remember is not to work harder than you need to. Most online libraries will have the option to export a reference for a text in the form of a bibtex compatible output, for example from iDiscover. Simply exporting the particular citation or reference allows for it to easily be imported into your bibliography file with the correct fields entered without worrying about all of the optional arguments yourself.

On iDiscover it is particularly easy, with EXPORT BIBTEX being one of the first options available once the text is selected. The text can then be copied and pasted into a larger bibliography subfile for ease of management.

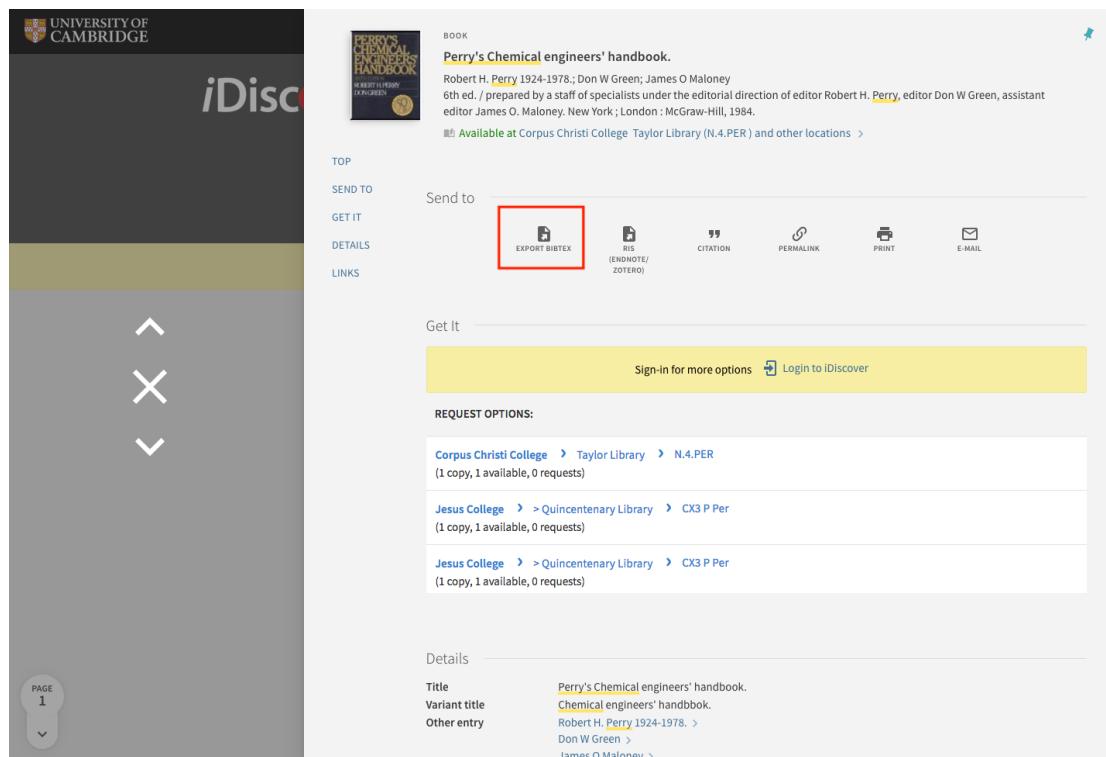


Figure 4: The bibtex export button in the iDiscover interface.

4.5 Lists

A list of figures can be made by `\listoffigures` and a list of tables can be made by `\listoftables`.

List of Figures

1	“DSC_8964” by Kent MacElwee is licensed under CC BY-NC-ND 2.0	2
2	There is also an overall figure label and caption.	3
3	An example.	4
4	The bibtex export button in the iDiscover interface.	10

List of Tables

1	This is the table caption.	2
---	------------------------------------	---

4.6 Other Referencing

Equations, figures, tables and sections may be labelled and cross-referenced within a document. A quick refresher on how to do maths:

```
\begin{equation}\label{eq:quadratic1}
y = x^2 + 2x + 6
\end{equation}
```

$$y = x^2 + 2x + 6 \quad (1)$$

```
\begin{align}
y &= x^2 + 2x + 6 \quad \label{eq:simplify_original} \\
&\equiv x^2 + 2x + 1 + 5 \quad \nonumber \\
&\equiv (x+1)^2 + 5 \quad \label{eq:simplify_answer}
\end{align}
```

$$y = x^2 + 2x + 6 \quad (2)$$

$$= x^2 + 2x + 1 + 5$$

$$= (x + 1)^2 + 5 \quad (3)$$

This section was labeled:

```
\section{Referencing}\label{sec:referencing}
```

The figure in the previous section is also labeled in the penultimate line of its code:

```
\begin{figure}[h]
\centering
\includegraphics[width=0.5\linewidth]{images/float_dog.jpg}
\caption{‘DSC\_8964’ by Kent MacElwee (CC BY-NC-ND 2.0).}
\label{fig:dog}
\end{figure}
```

To reference something, use the `\ref{...}` command. For example,

```
\ref{eq:simplify_answer}
```

prints “3”. Only the number is printed; typically you type something like

```
An example is shown in Figure \ref{fig:dog}
```

to produce text “An example is shown in Figure 1”.