Day 01: Intro to LaTeX

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LaTeX101

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Outline

Introduction

Course Background, What is LaTeX?

- **Adapted from** – https://www.learnlatex.org/.
  - Day 1 – `learnlatex.org` lessons 1-6.
  - Day 2 – `learnlatex.org` lessons 7-12.
  - Day 3 – Specific templates (resume, presentation slides).
- **Slides Available** – https://github.com/mdelrosa/latex-101.
  - Template based on Clara Pavillet's Oxford Template
- **Slack back channel**
  - UC Davis Slack channel

Markup Language – Instructions for rendering a document.

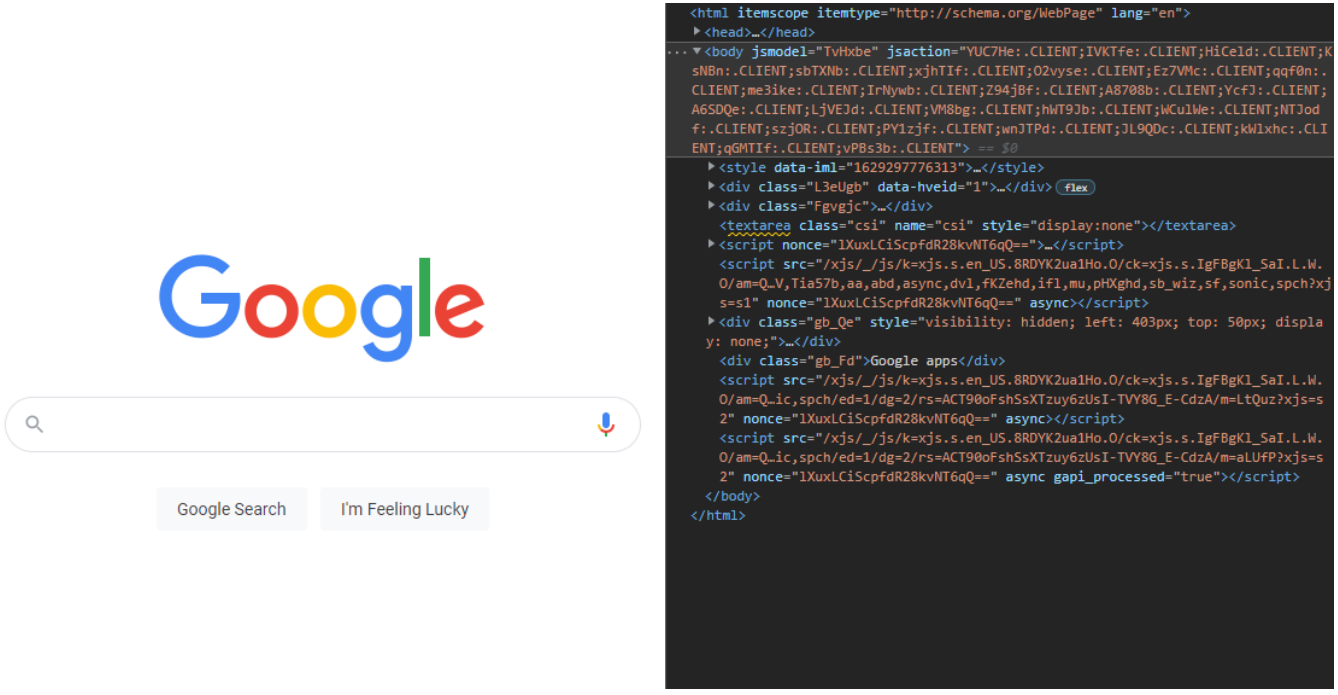

Figure 1: Example – HTML for websites

What is LaTeX?

LaTeX– Markup language for academic documents (e.g., publications, presentations, lecture notes, assignments).

```
\begin{frame}{What is \LaTeX?}
  \LaTeX -- Markup language for academic documents (e.g., publications, presentations, lecture notes, assignments).
  \begin{figure}
    \includegraphics[width=0.8\linewidth]{latex_example.png}
    \caption{Example -- \LaTeX \; snippet for this slide.}
    \label{fig:latex}
  \end{figure}
\end{frame}
```

Figure 2: Example – LaTeX snippet for this slide.

$$V_s = \int_{-R}^{R} \pi(R^2 - x^2)dx = \frac{4}{3}\pi R^3 \tag{1}$$

```latex
\begin{equation}
  V_s = \int_{-R}^R \pi (R^2 - x^2) dx = \frac{4}{3}\pi R^3 \label{eq:sphere}
\end{equation}
```

Figure 3: Example – LaTeXsnippet for this equation.

Enables rich cross-referencing of equations, figures, tables

- Equation 1 (previous page)
- Table 1

Feature	**Support**
Figures	Yes!
Equations	Yes!
Tables	Yes!
Bibliographies	Yes!

Table 1: A simple table.

Two primary components/steps:

1. Write your LaTeXfile(s) (**Text editor**)
2. "Compile" or "Typeset" your document (**LaTeX system**)

Figure 4: Text editors (Notepad, Notepad++, Sublime Text) and LaTeX distributions (MikTeX, TeXLive, and TeX Studio)

- Editors/systems installed on local device (faster, private)

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- Editor/systems online (convenient, collaborative)

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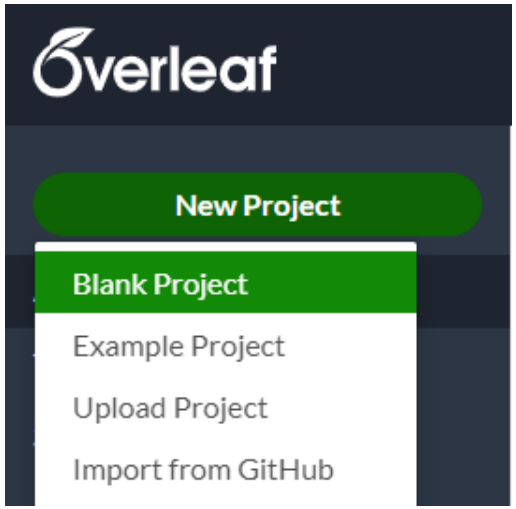
- Editor/systems online (convenient, collaborative)
- Will use **Overleaf** for this course (free account required)

Our First LaTeX Project

1. Make an Overleaf account (free!)
2. Go to `https://www.overleaf.com/project`
3. Create a blank project and pick a project name



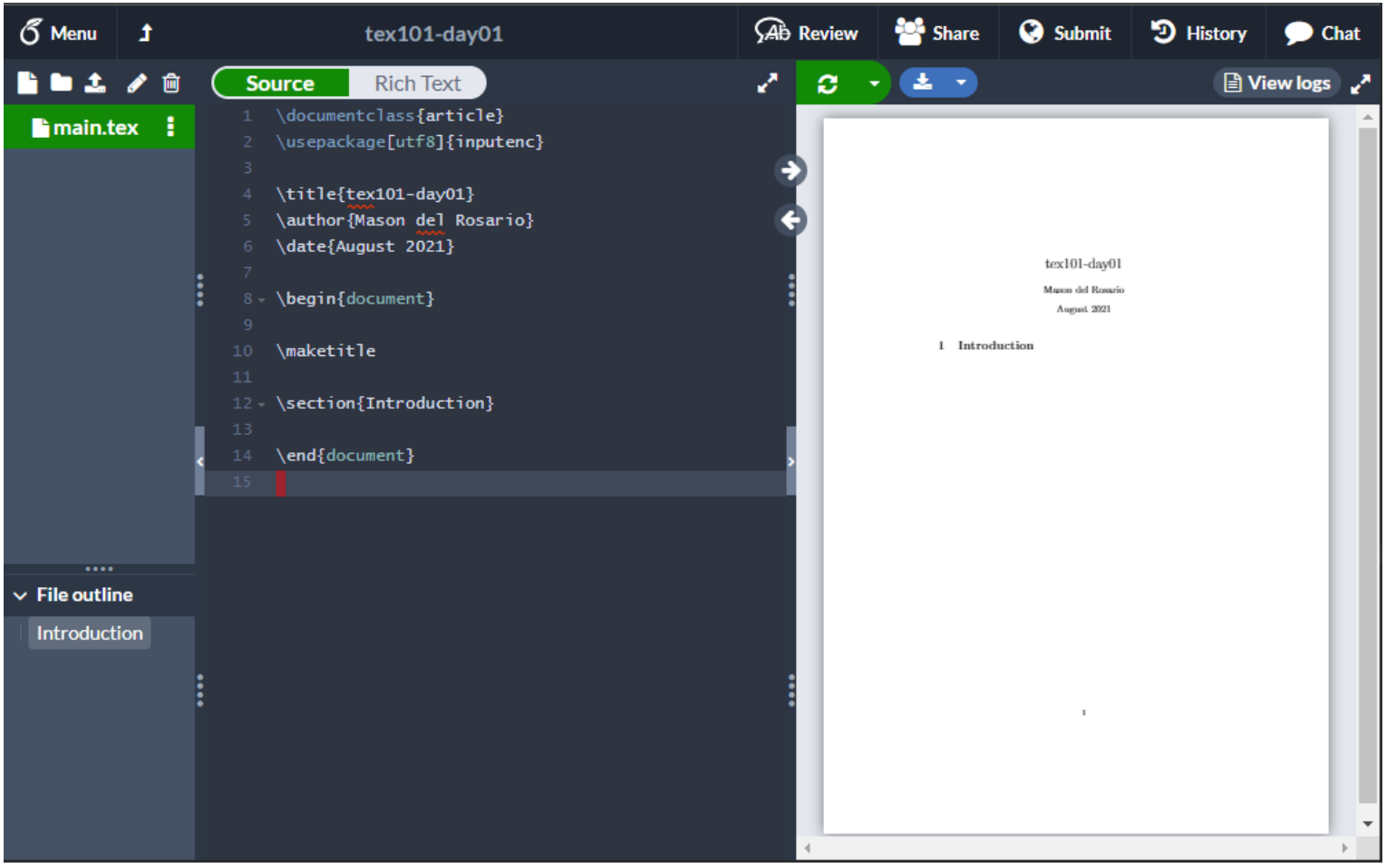


Figure 5: Result of creating new project on Overleaf

Document Structure

Commands, Environments, Errors

LaTeX has special characters to define commands and arguments.

- Backslashes (`\`) = start of a commands
- Curly brackets (`{ }`) = mandatory arguments (i.e., inputs to commands)
- Square brackets (`[ ]`) = optional arguments

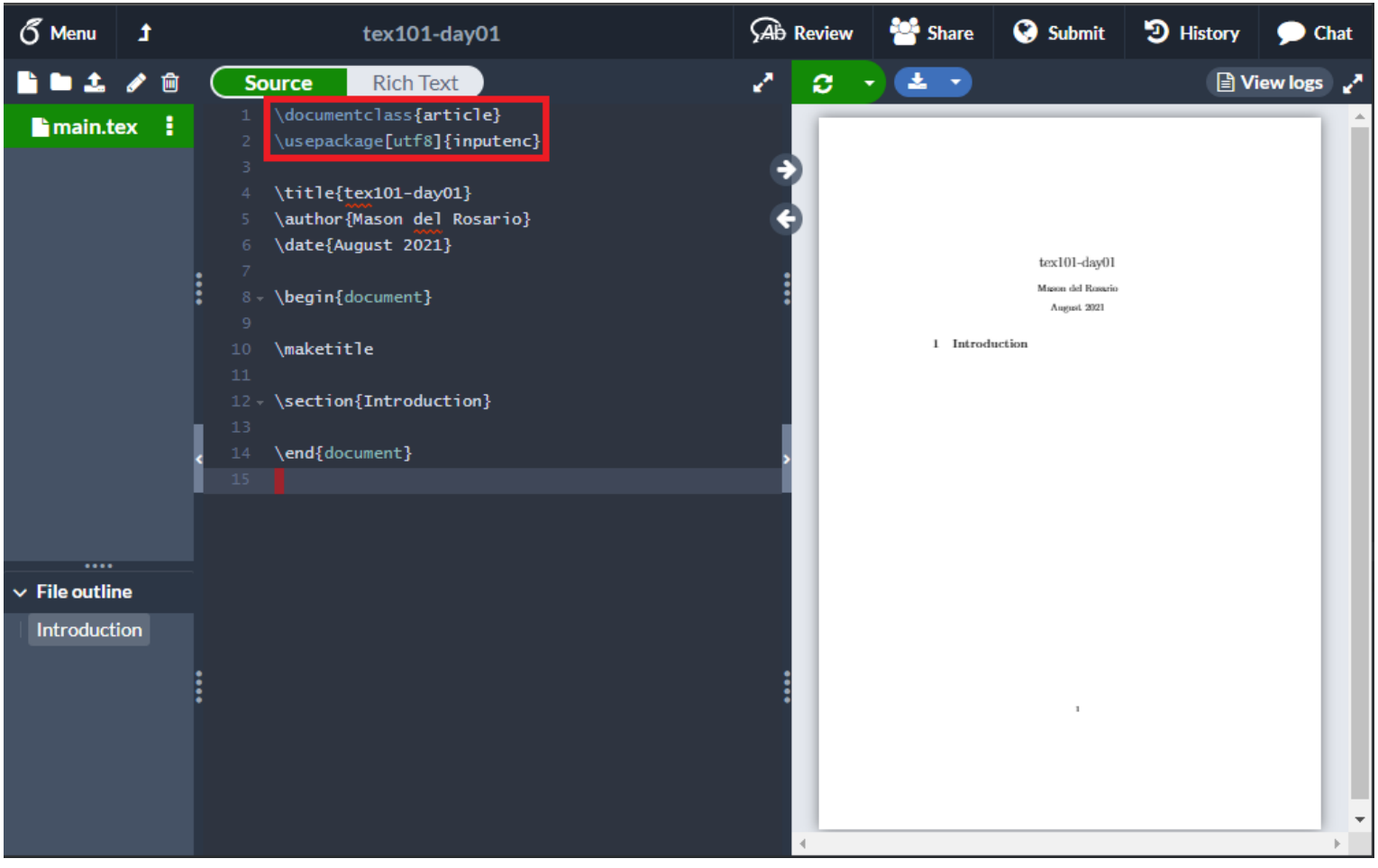


Figure 6: Commands/arguments defining the document class and text encoding of our project.

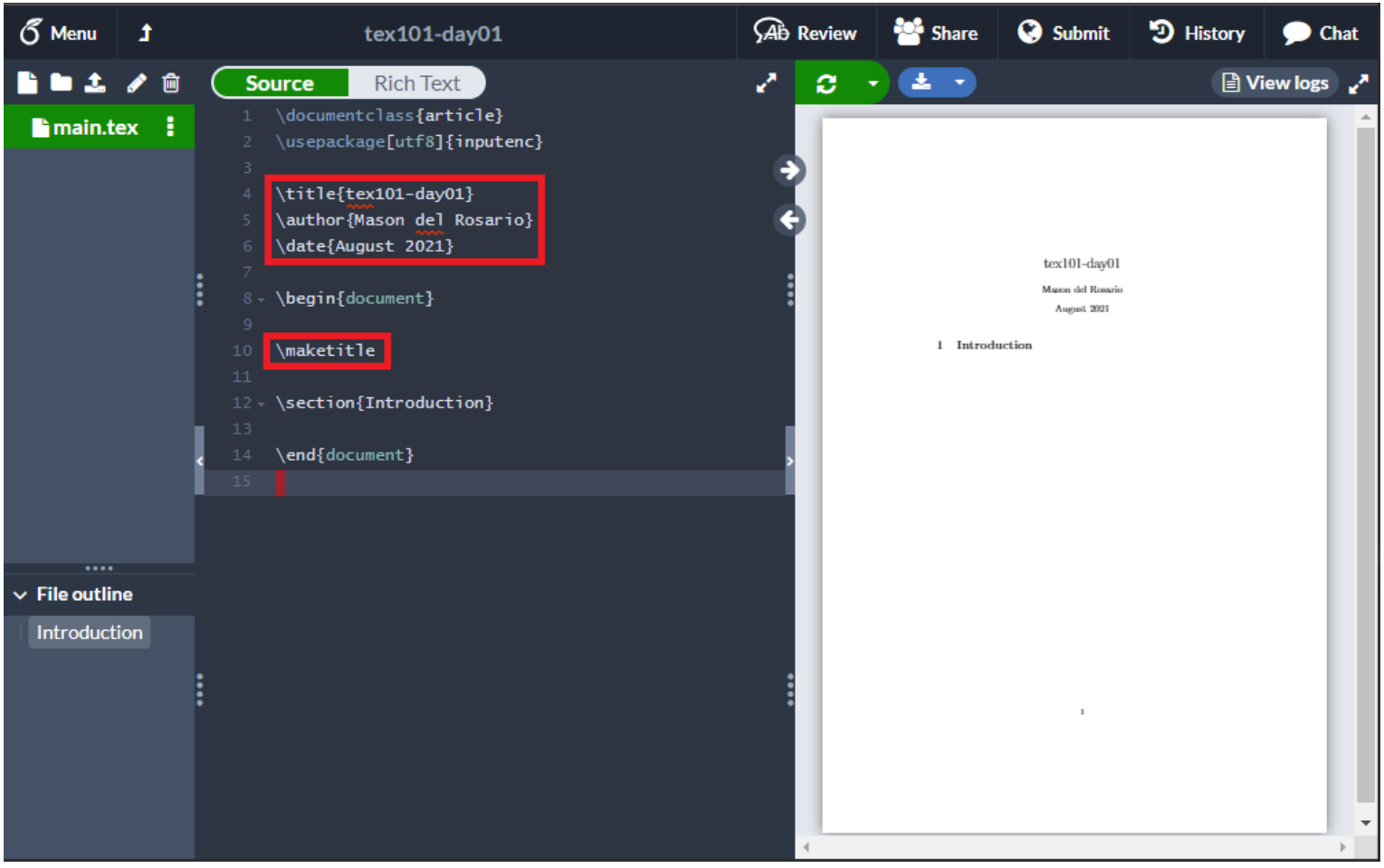


Figure 7: Commands/arguments defining the title in our project.

Environments = `\begin{...}` and `\end{...}` commands.

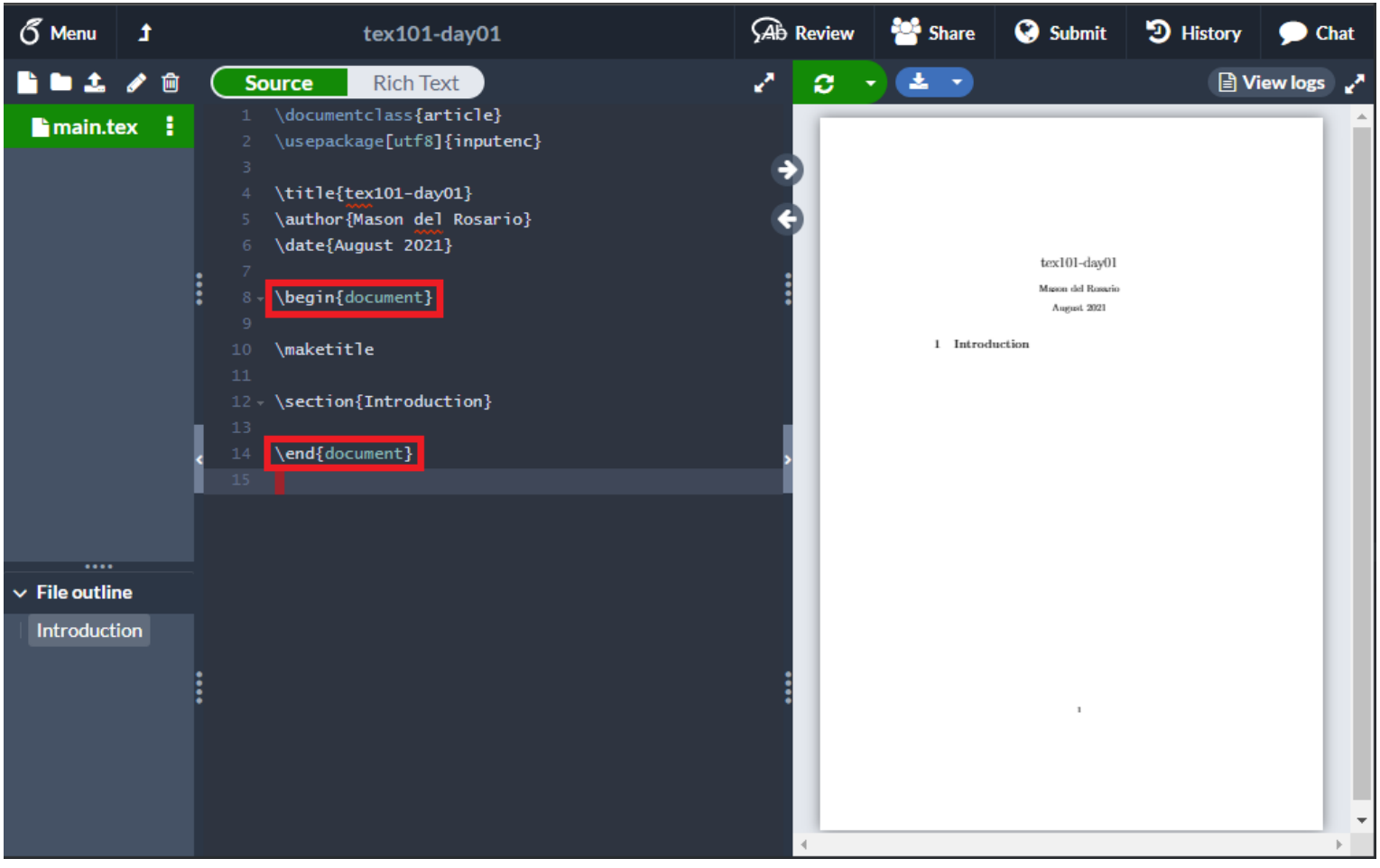


Figure 8: Every LaTeX file includes a `document` environment.

Lots of different environments! Will go over more in this course.

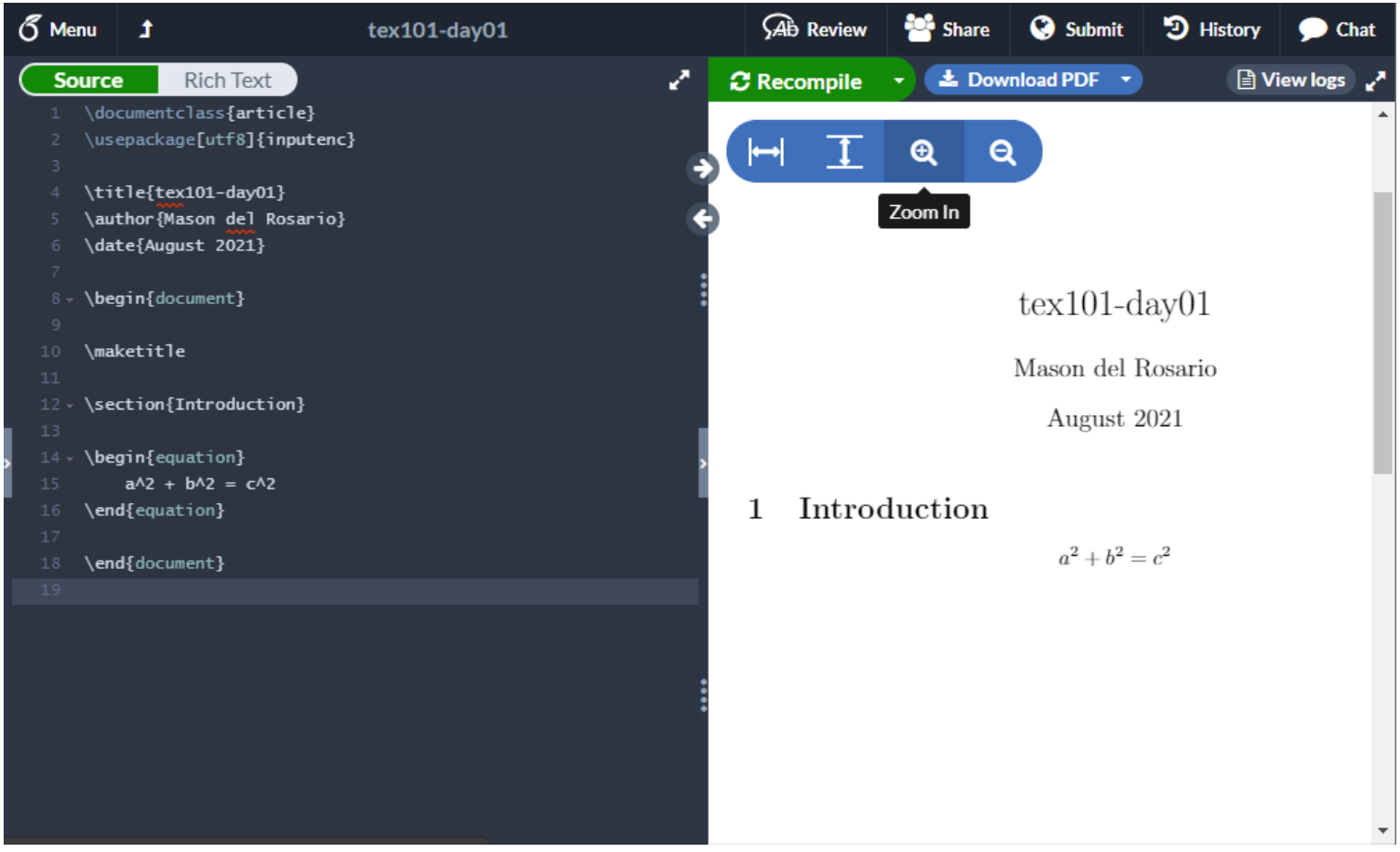


Figure 9: Try writing an `equation` environment!

- What happens when we mess up?
- Remove the `\end{equation}` command, compile the document.

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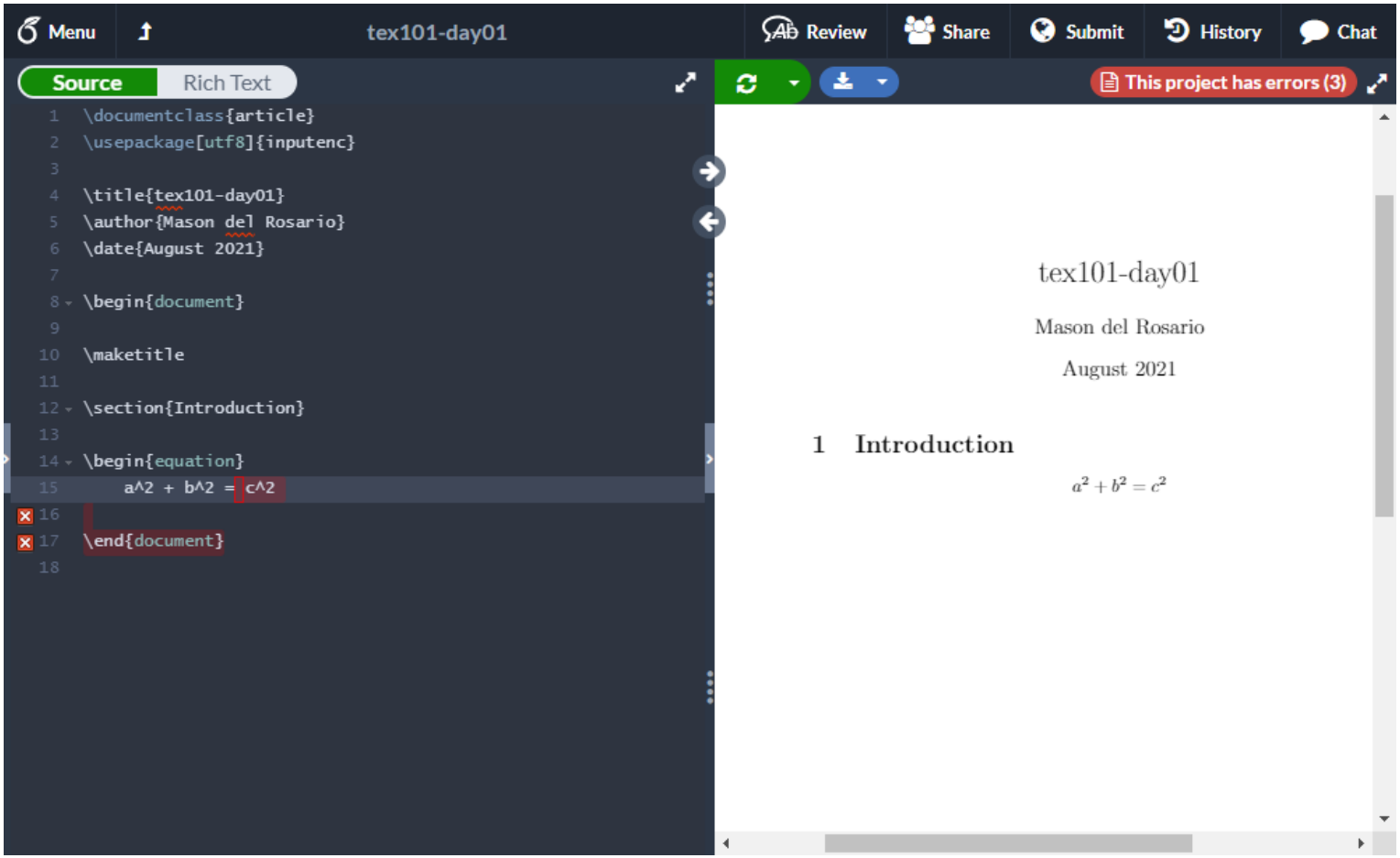

Figure 10: Click on the red badge to reveal more details.

Some errors might be sneakier. Google is your friend!

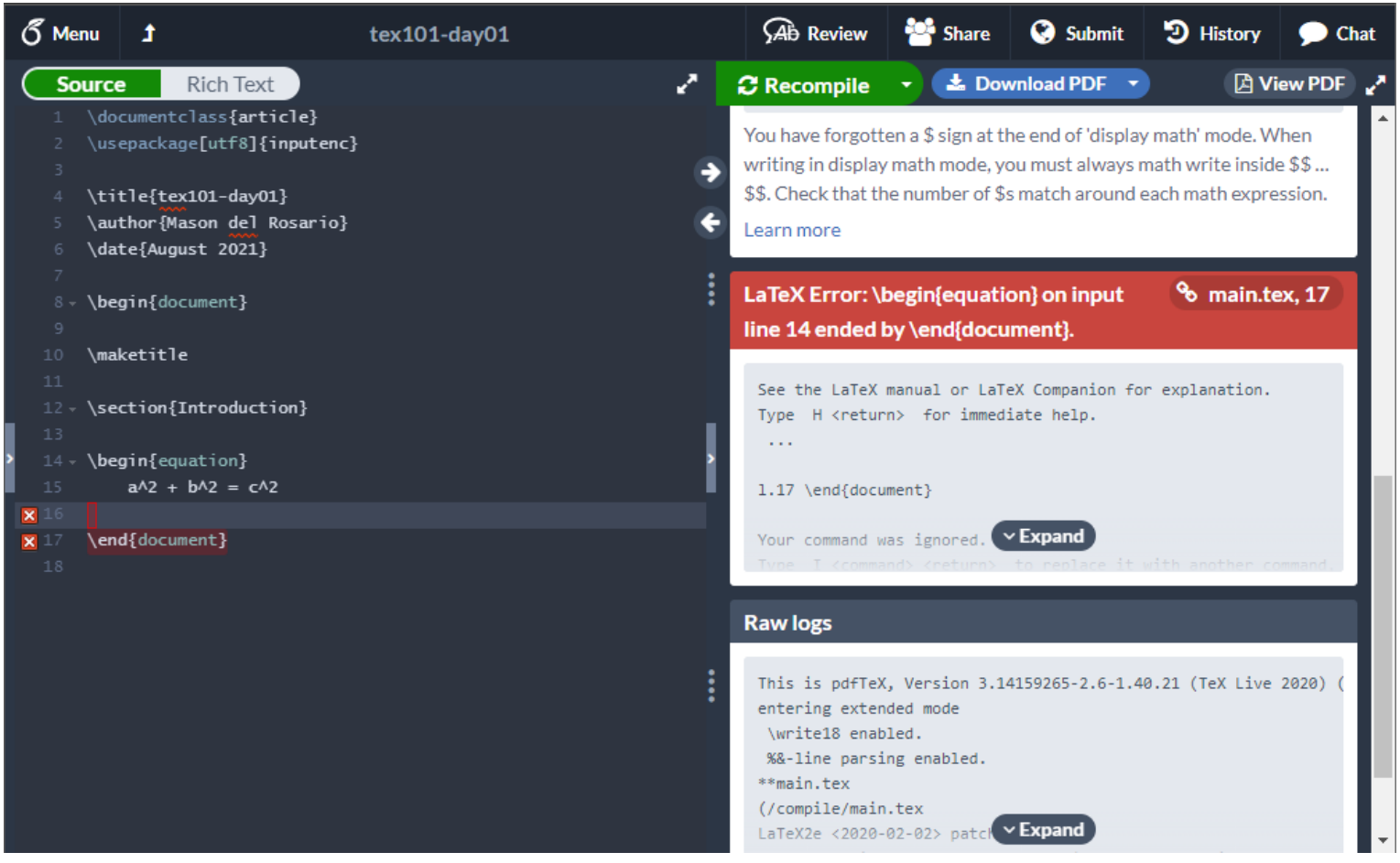

Figure 11: Compiler has returned an error.

Exercise: Text and Whitespace

- Try adding text to your project, recompiling, and seeing the changes in your PDF.
- Add some paragraphs with variable spacing. How does LaTeXhandle multiple spaces?
- Share your observations/questions in chat!

Logical structure

Text formatting, sectioning, lists

Some common commands for formatting text:

- `\textbf`: **Make text boldface.**
- `\textit`: *Make text italic.*
- `\underline`: Underline text.
- `\texttt`: `Make text resemble typewriter.`
- And so many more! For example, see `https://latex-tutorial.com/changing-font-style/`.

Sectioning commands

LaTeX provides commands to generate section/subsection headings.

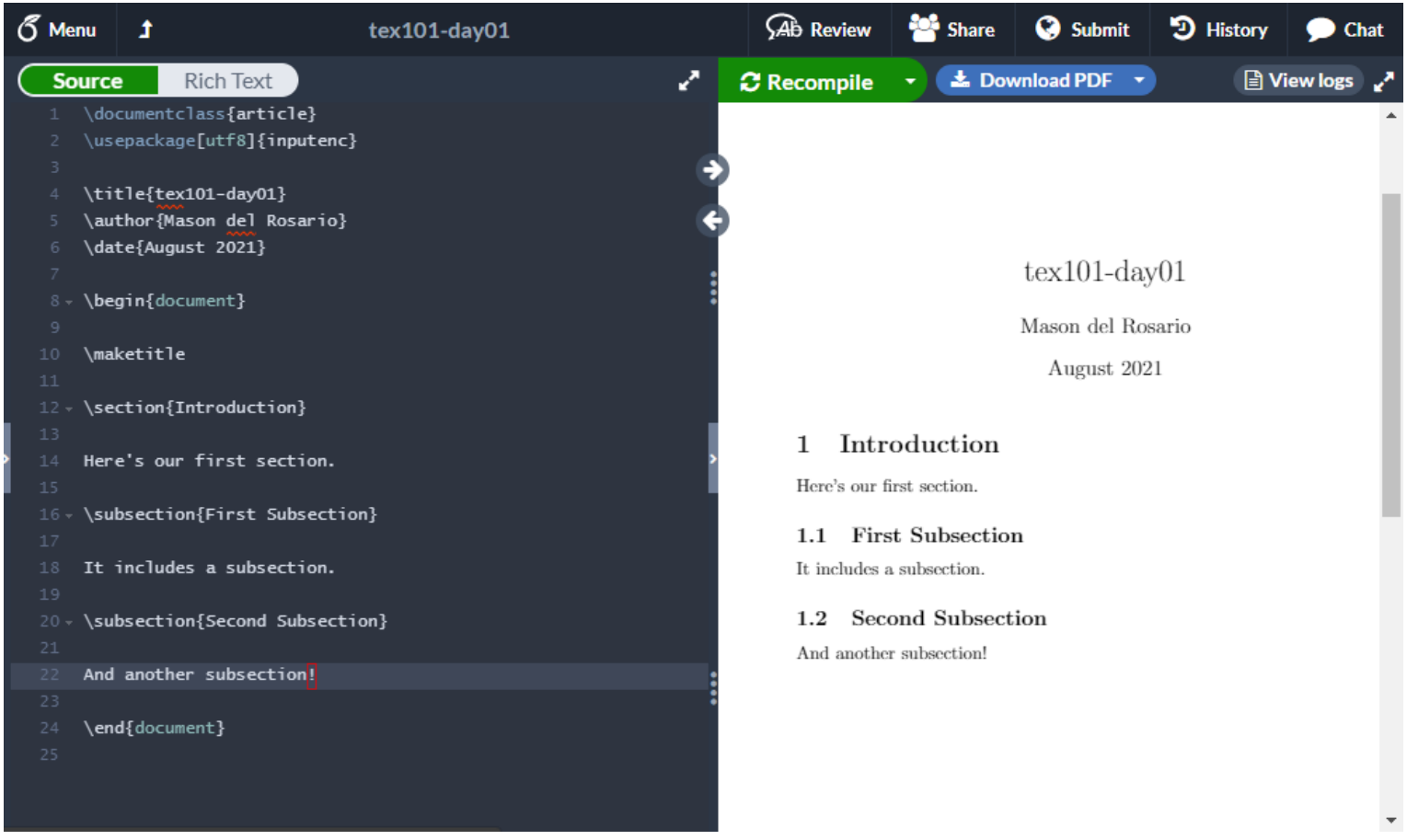

Figure 12: Numbers for different (sub)sections are automatically generated.

Sectioning commands

Different section levels available:

- `\chapter` (for `\documentclass{book}`, `\documentclass{report}`)
- `\section`
- `\subsection`
- `\subsubsection`
- `\paragraph` (rarely used!)

Lists in LaTeXcan be unordered or ordered:

- First unordered item
- Second unordered item
- Third unordered item

1. First ordered item
2. Second ordered item
3. Third ordered item

List commands: `itemize/enumerate` environments + `\item` commands per each line.

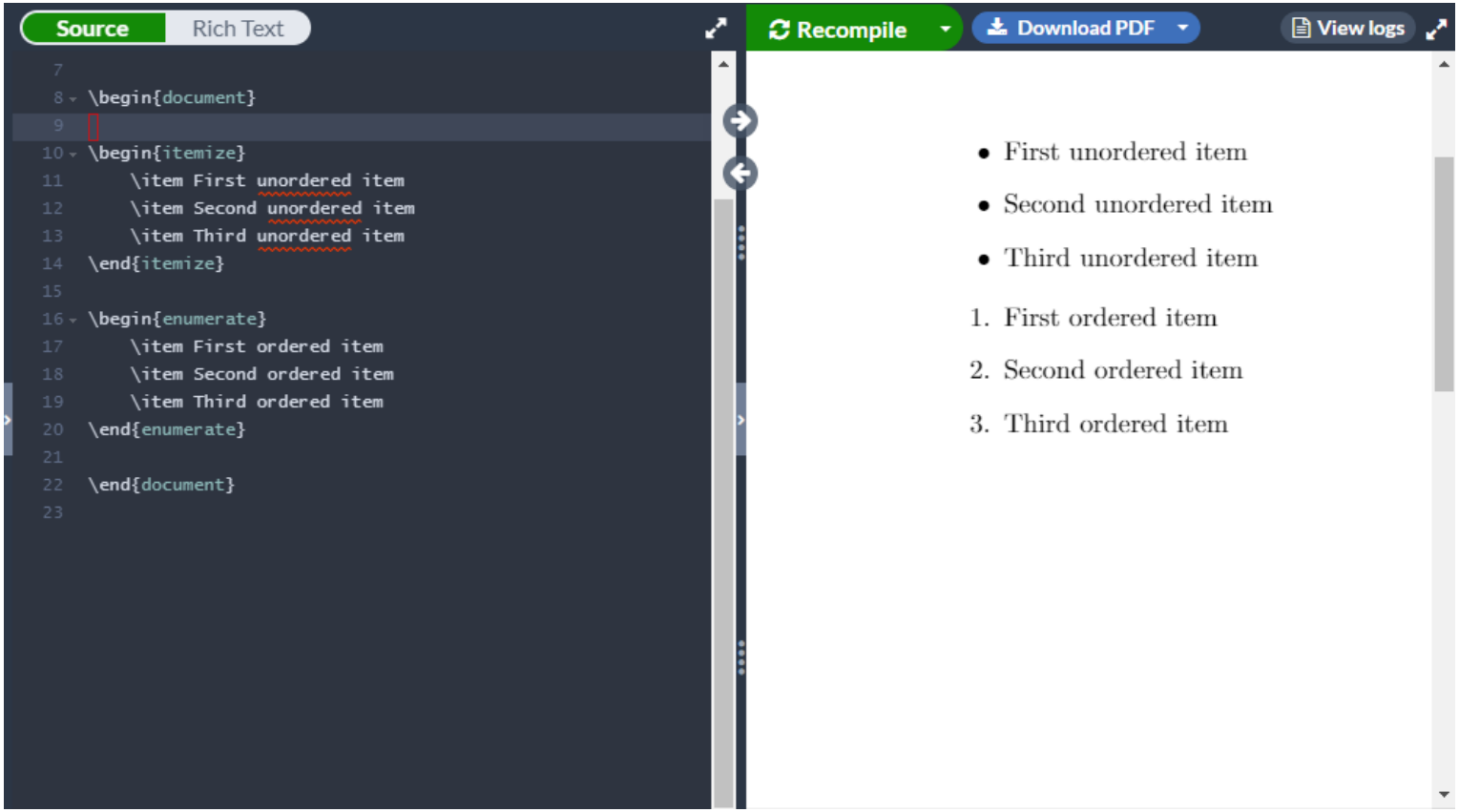

Figure 13: Numbers for different (sub)sections are automatically generated.

Exercises

- Try formatting some text. Can you find any new formats at `https://latex-tutorial.com/changing-font-style/`?
- Try out `\paragraph` and (even) `\subparagraph` to see they work: by default, they don't add numbers.
- Make some lists, and nest one list inside another. How does the format of the numbers or markers change? (You can only go to four levels with standard LaTeX.)

Document Classes

Base classes, presentations

What `\documentclass` does

Controls general layout of document, changing:

- Design (margins, fonts, spacing, etc.)
- Sectioning (e.g., `\chapter`)
- Title location (top of page vs. separate page)
- Add new commands (e.g., `frame` environments for slides)

What `\documentclass` does

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- Add new commands (e.g., `frame` environments for slides)

Can manually set global options (i.e., `\documentclass[<options>]{<name>}`).

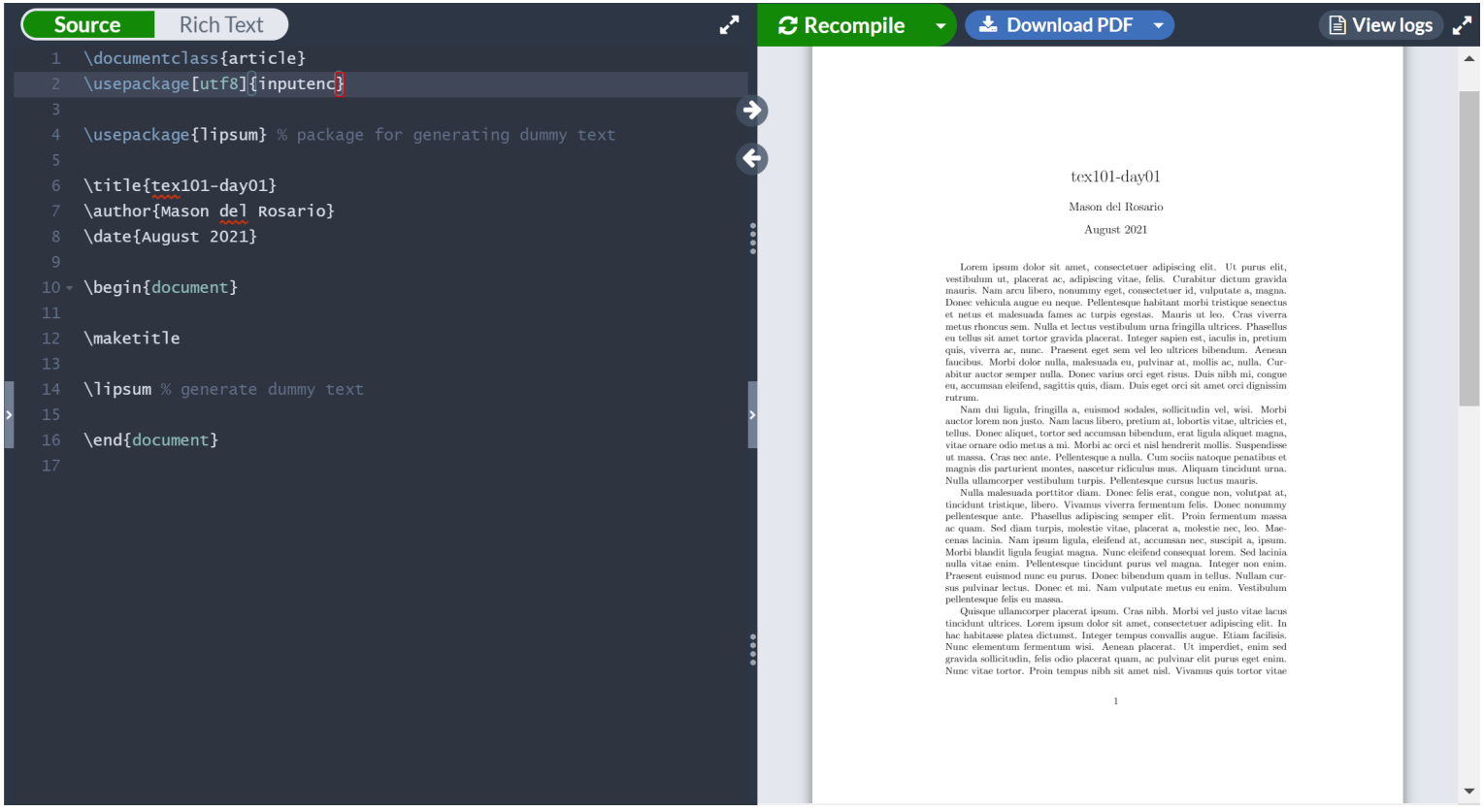

Figure 14: Our starter project is an `article` class.

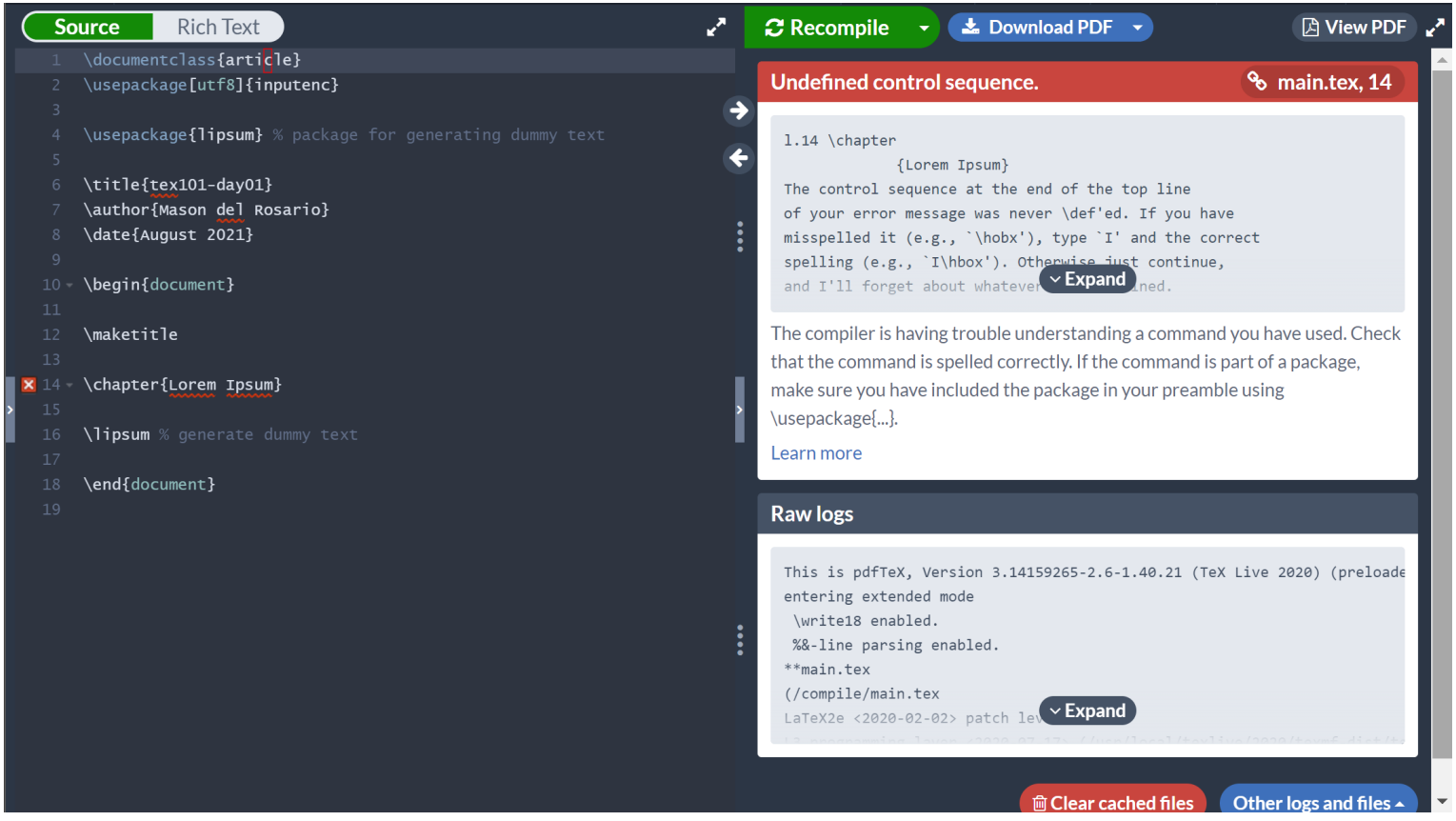

Figure 15: Adding a `\chapter` causes an error.

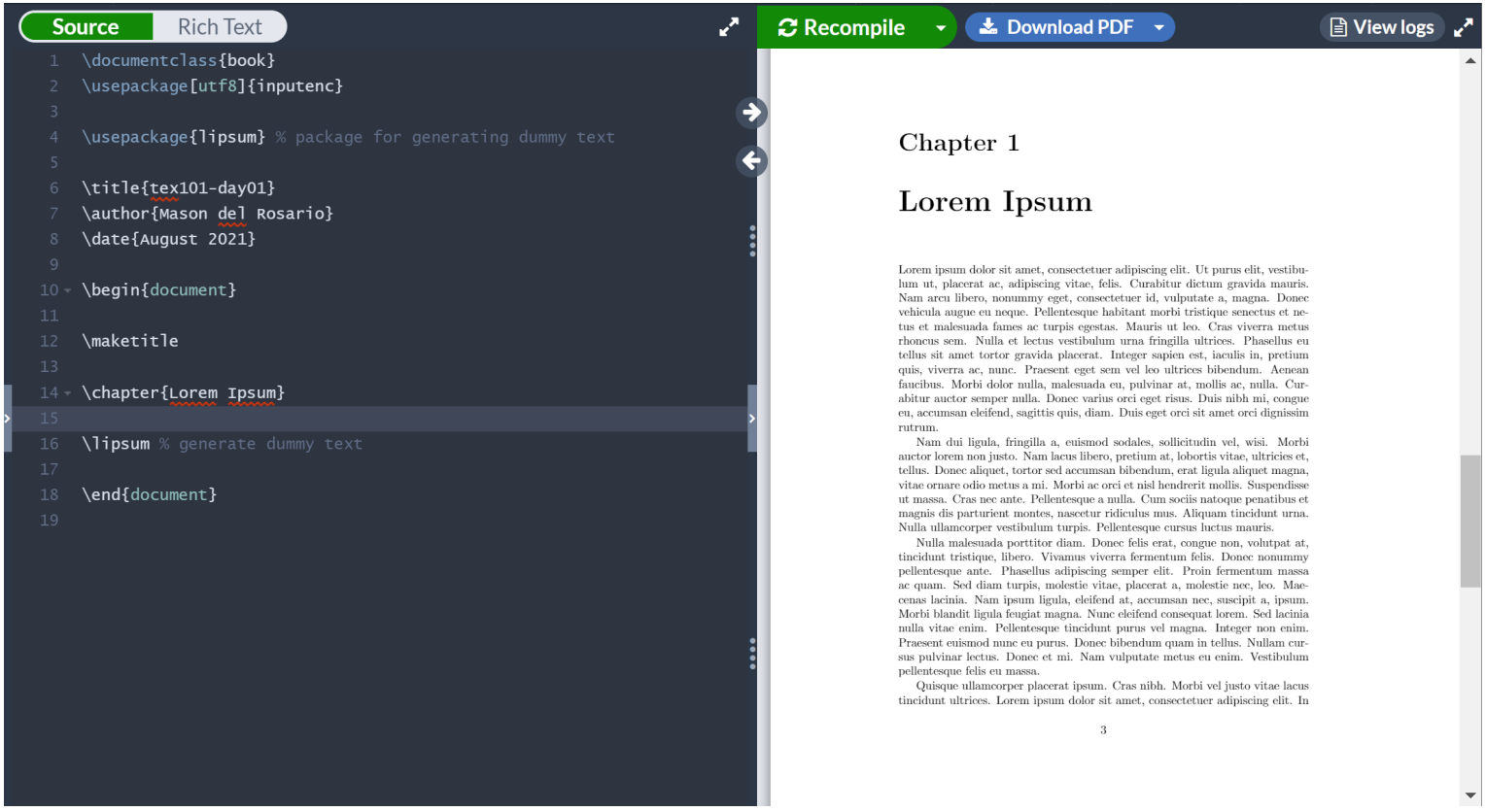

Figure 16: Changing to `\documentclass{book}` enables `\chapter`.

Default `\documentclasses` provided by LaTeX:

- `article` - short documents without chapters
- `report` - longer documents with chapters, single-sided printing
- `book` - longer documents with chapters, double-sided printing, front-/back-matter (e.g., index)
- `letter` - correspondence with no sections
- `slides` - for presentations (not used in practice; will explain!)

Exercises

- Explore changing the document class between base classes (e.g., `letter`, `report`). How do these affect the appearance of the document?
- Using the square brackets (`[]`), add the option `twocolumn` to your `documentclass`. How does this affect the layout of the document?

Packages and Definitions

Base LaTeXdoesn't do everything. Packages add more functionality, including:

- Change how parts of LaTeXwork
- Add new commands (e.g. `\lipsum` package for filler text)
- Change document design

Example: `geometry` – enables direct control of margins, borders, line spacing, etc.

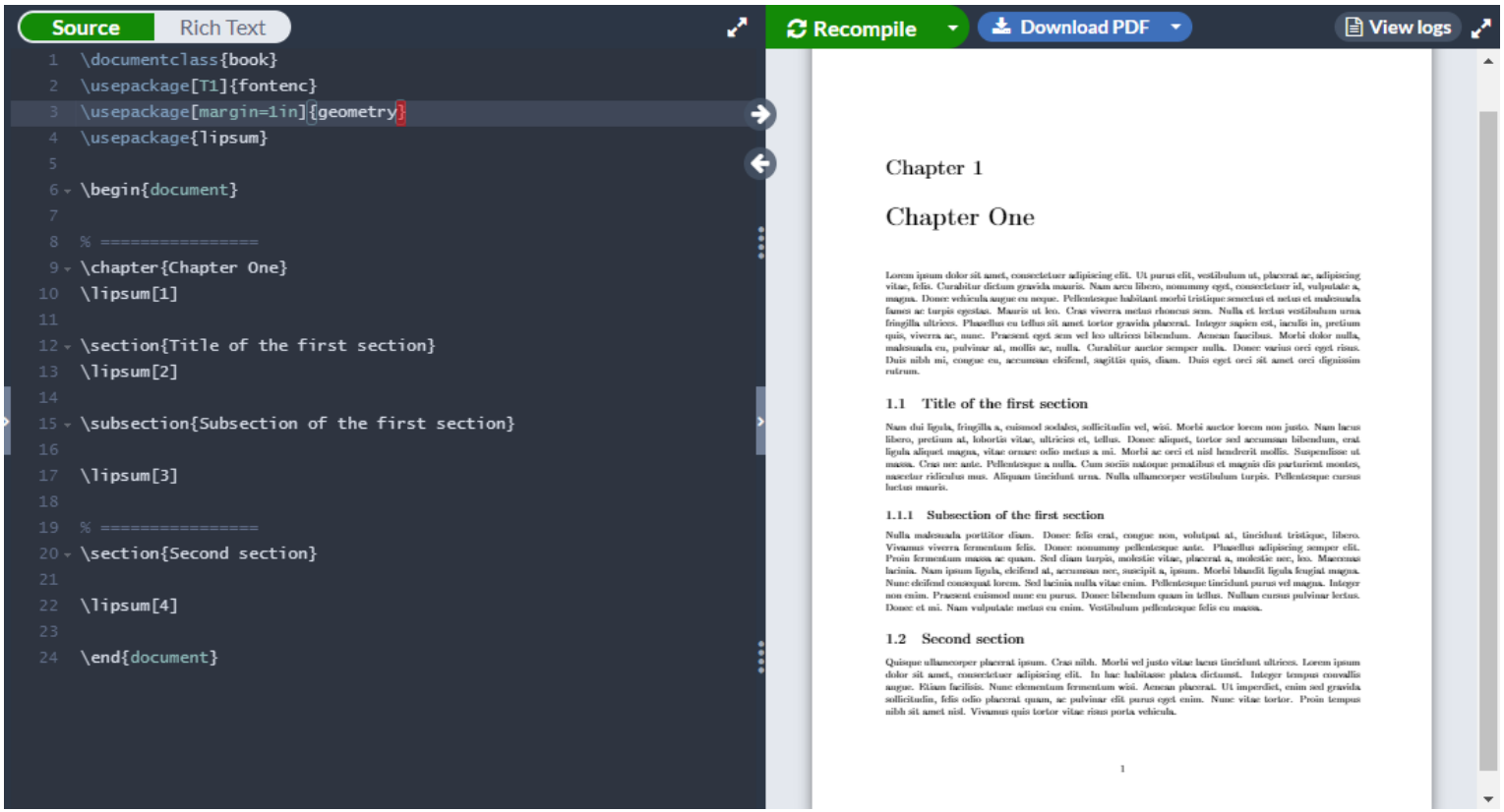

Figure 17: `geometry` package with 1" page margins.

Example: `geometry` – enables direct control of margins, borders, line spacing, etc.

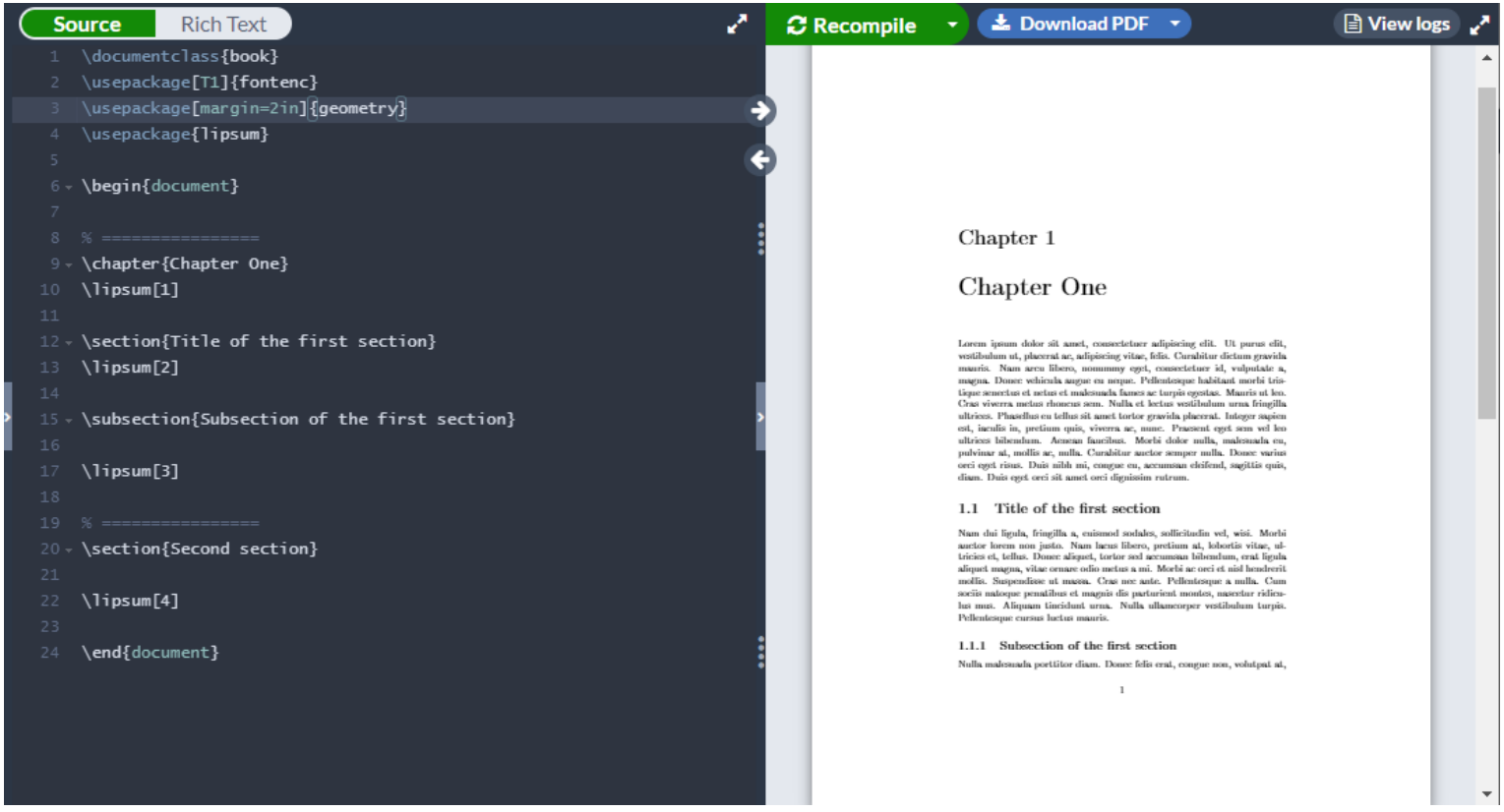

Figure 18: `geometry` package with 2" page margins.

Can't find a command you want? Want to avoid repeating yourself?

Use definitions to define your own commands!

Line 6 `\newcommand` defines a `\kw` command.

- `\newcommand\kw` → assign `kw` as command name
- `[1]` → number of arguments
- `#1` → first argument supplied to command

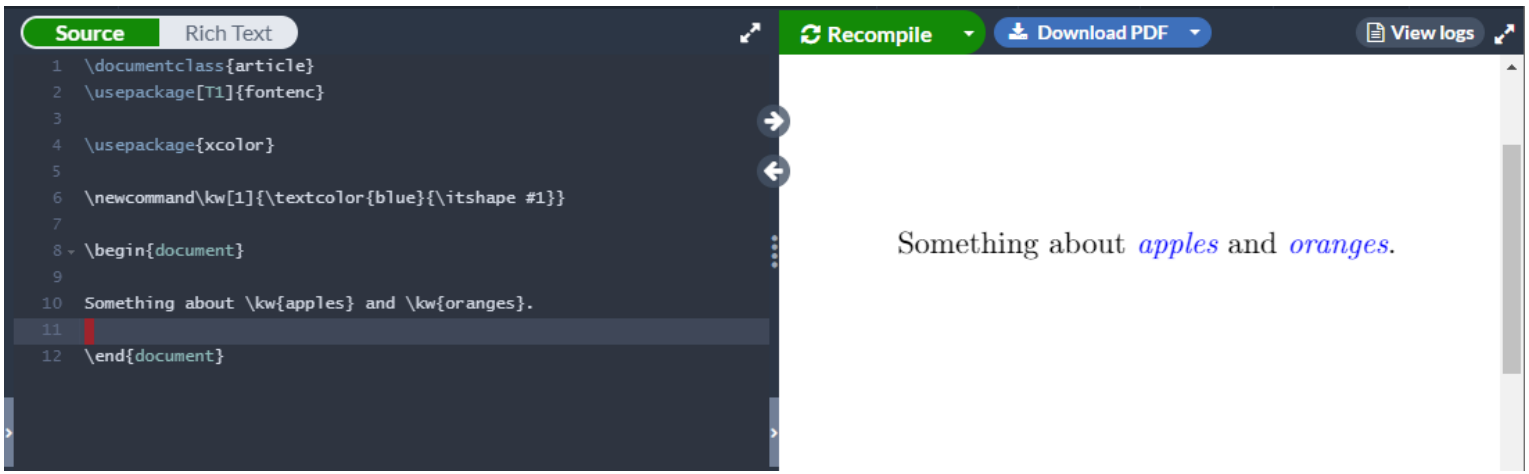

Figure 19: A definition for a custom 'keyword' command `\kw`.

Day 01 Summary

Today we covered:

- Document structure (commands, environments, errors)
- Logical structure (sections, environments, lists)
- Document classes (base classes)
- Packages and definitions

When we come back, I'll introduce the assignment:

- `https://github.com/mdelrosa/latex101/blob/master/day01/exe`

End of Day 01

- Finished Lessons 1-6 from `learnlatex.org`
- Tomorrow: Lessons 7-12 from `learnlatex.org`
- Questions? Ask on the Slack channel! (#latex101)