

Introduction to R & RStudio

Week 1 - Lecture 4 & Lab 0

Hello R, This is Me!

Today...

In this lecture, we will...

- learn what is R, RStudio and Quarto Document
- create A STAT-218 Folder in Your Desktop
- create A New Quarto Document
 - save this document to your STAT-218 Folder
- fill out the document
 - have first coding experience by
 - saying Hello World!
 - creating an Object
 - running some functions
- learn How to Get Help
- render The First PDF

R and RStudio



Hadley Wickham and others at RStudio, CC BY-SA 4.0, via Wikimedia Commons



RStudio, Inc., Public domain, via Wikimedia Commons

- **R** is a computer language.
 - **R** is an environment for statistical computing and graphics.
 - **R** provides a wide variety of statistical and graphical techniques.
 - **R** is a free open source software
-
- **RStudio** is an *integrated development environment* (IDE) for **R**
 - **RStudio** has four main panes each in a quadrant of your screen

What Can We Do with RStudio?

- Everything we need to do for this class and beyond!

What is Quarto Document?

Quarto is...

- an open-source scientific and technical publishing system
- a multi-language, next-generation version of R Markdown.
- enabling you to combine code and text to create rich outputs, like reports and presentations. *(like an advanced version of a word processing tool)*

Important

- R is the programming language for statistical computing
- RStudio is the IDE that facilitates R programming
- Quarto document is a document type that combines text and code
- In short, we will create Quarto documents in RStudio and we will combine text and R codes in that Quarto document to create our lab reports.

Today's Tasks

Task 1: Create A Folder



Task 2: Creating a Quarto Document



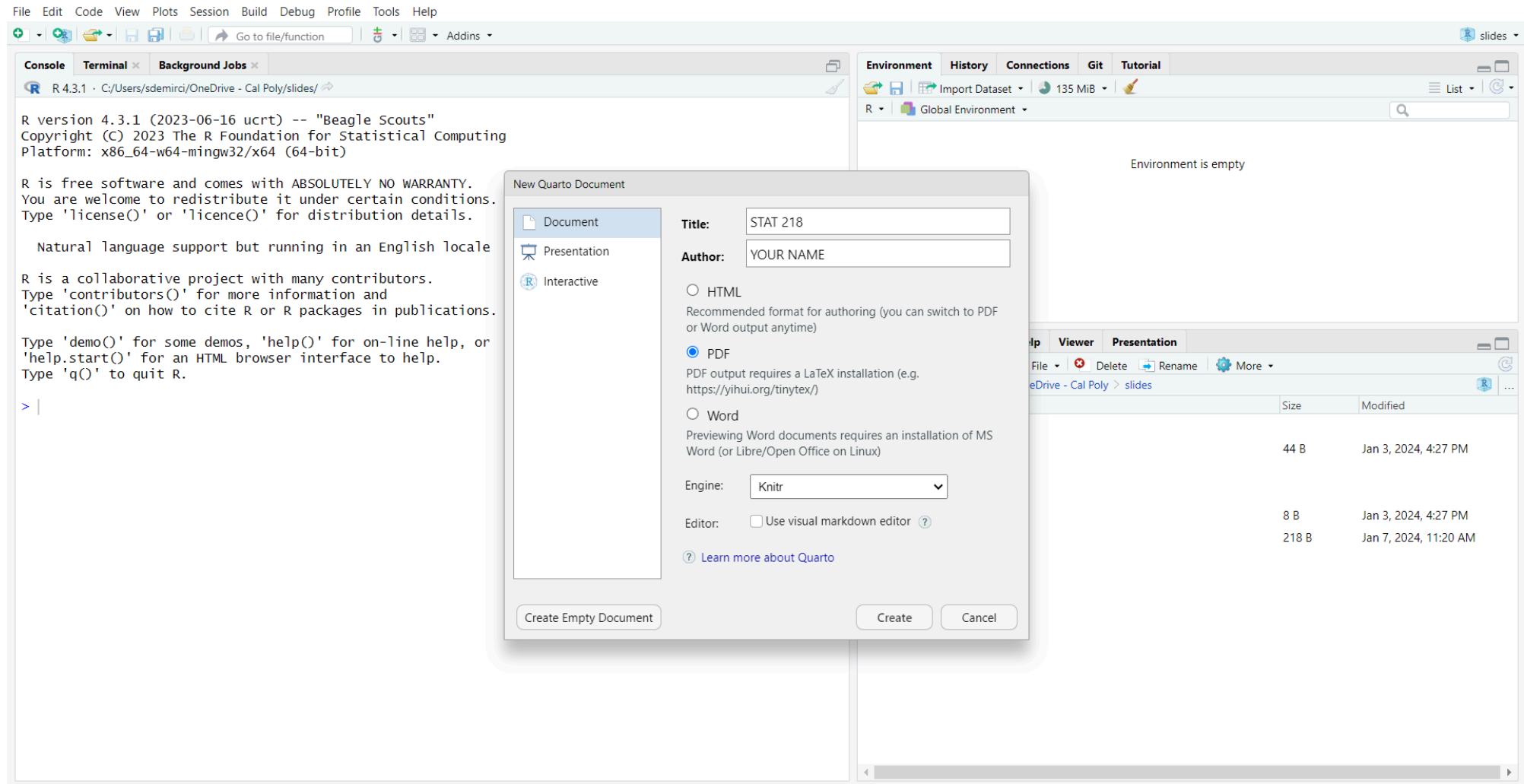
Tip

You can create your own Quarto document by clicking [File > New File > Quarto Document](#)

Let's try to create our first Quarto document!

WARNING! I use Windows, you may use Mac or Linux or online version of R. Thus, your screen might look a bit different than mine.

Task 2: Creating and Saving a Quarto Document



How to Create a New Quarto Document

Task 2: Creating and Saving a Quarto Document

- You can save your own Quarto document by clicking
 - `File > Save`
- After that, YOU NEED TO FIND YOUR FOLDER TO SAVE YOUR FILE.

Panes in RStudio

The image shows the RStudio interface with several panes and handwritten annotations in orange text with blue arrows pointing to specific areas.

Source Pane (Top Left): Contains a Quarto document. A blue box highlights the text: "This is our Quarto document. We will mainly work here!". The code in the pane includes a title, author, format, and a code chunk for running code.

Environment Pane (Top Right): A blue box highlights the "Environment" tab. A blue arrow points to it with the text: "Think of the 'Environment' tab in this pane as R's memory." The pane shows "Global Environment" and "Environment is empty".

Files, Plots, Packages, Help, Viewer, Presentation Tabs (Middle Right): A blue box highlights these tabs. A blue arrow points to them with the text: "There are 6 'Tabs' in this 'pane!'".

Console Pane (Bottom Left): A blue box highlights the console output. A blue arrow points to it with the text: "We use this Console Pane to write our code." The console shows the R version, copyright, and license information.

Output Pane (Bottom Right): A blue box highlights the output pane. A blue arrow points to it with the text: "We will use this OUTPUT PANE containing the Files, Plots, Packages, Help, Viewer, an Presentation tabs." The output pane is currently empty.

A Closer Look into the Quarto Document

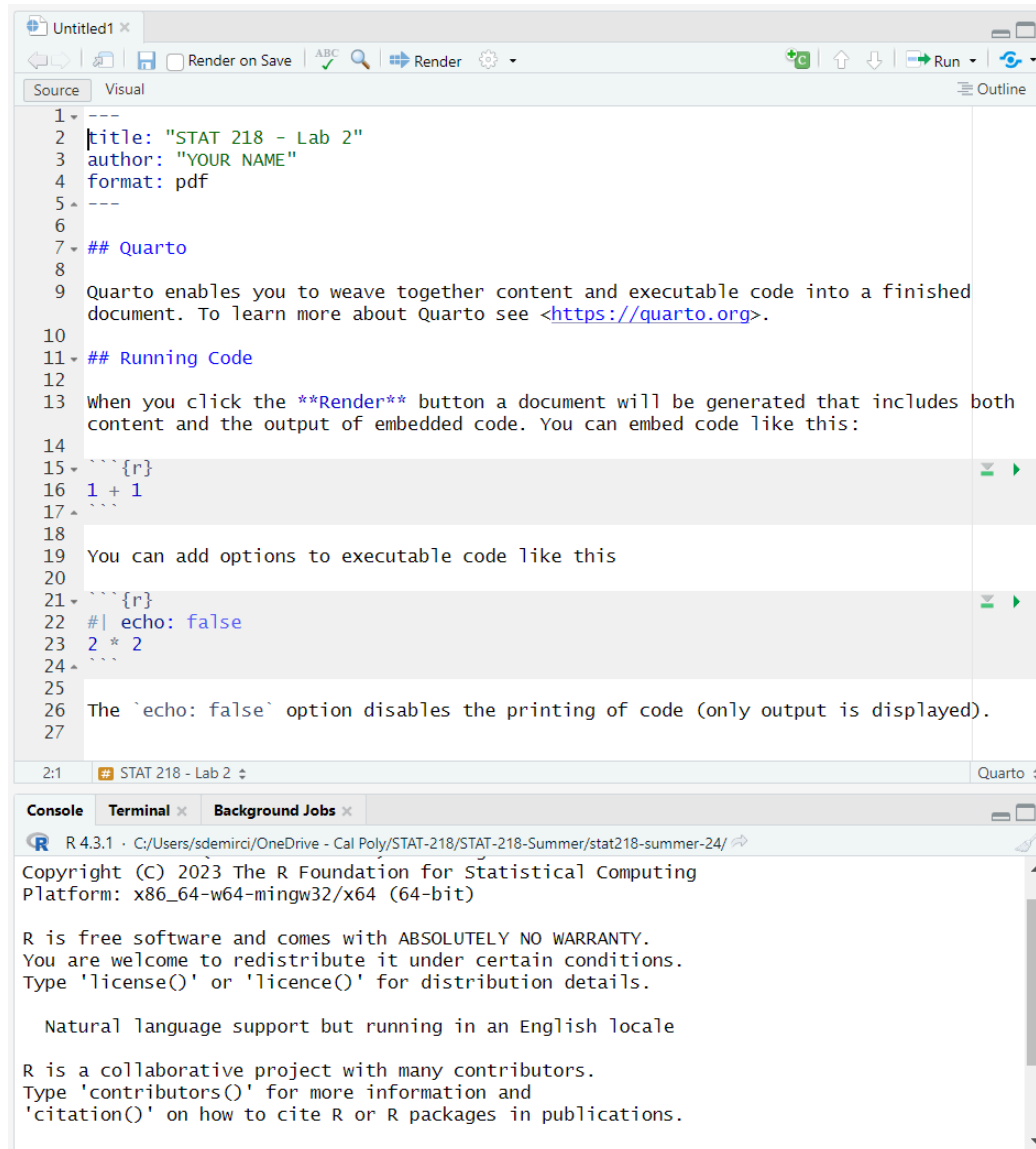
The screenshot shows the RStudio interface with a Quarto document open. The document is titled "Untitled1*" and contains the following code:

```
1 ---
2 title: "Descriptive Statistics"
3 subtitle: "STAT 218 - Week 2, Lecture 2, Lab 2"
4 author: Dr. Sinem Demirci
5 date: "2023-10-03"
6 date-format: "MMMM D[<sup style='font-size:65%;>th</sup>], YYYY"
7 format: html
8 execute:
9   echo: true
10 ---
11
12 ## Hello, My Name Is Quarto Document!
13 |
14
15 Quarto enables you to weave together content and executable code into a finished document. To learn more about Quarto see
16 <https://quarto.org>.
17
18 ## Running Code
19 When you click the Render button a document will be generated that includes both content and the output of embedded code.
20 You can embed code like this:
21
22 ```{r}
23 1 + 1
24 ```
25
26 You can add options to executable code like this
27
28 ```{r}
29 #| echo: false
30 2 * 2
31 ```
32
33 The `echo: false` option disables the printing of code (only output is displayed).
```

Handwritten annotations in red explain the components:

- A red circle around the **Render** button in the toolbar is annotated with: "A magical button that turns this page to something familiar like .pdf .docx or even .html".
- A red circle around the **Render** button in the toolbar is annotated with: "This part (YAML) is something that you don't need to learn." (referring to the YAML header).
- A red bracket underlines the text from line 12 to 16, annotated with: "Think this part as your text document".
- A red arrow points to the code chunk starting at line 22, annotated with: "This is where we write our R codes (code chunk)".
- A red arrow points to the code chunk starting at line 28, annotated with: "This is another code chunk with a chunk option!".
- A red arrow points to the `echo: false` option in the code chunk, annotated with: "We called this line as `inline code`".
- A red circle around the **Run** button in the toolbar is annotated with: "Run the code".

Task 3: Play with Your First Quarto Document



The screenshot shows the Quarto editor interface. The top toolbar includes icons for file operations, a 'Render on Save' checkbox, a search icon, and a 'Render' button. The document is titled 'Untitled1'. The source view shows the following content:

```
1 ---
2 title: "STAT 218 - Lab 2"
3 author: "YOUR NAME"
4 format: pdf
5 ---
6
7 ## Quarto
8
9 Quarto enables you to weave together content and executable code into a finished
10 document. To learn more about Quarto see <https://quarto.org>.
11
12 ## Running Code
13
14 When you click the Render button a document will be generated that includes both
15 content and the output of embedded code. You can embed code like this:
16
17 ```{r}
18 1 + 1
19 ```
20
21 You can add options to executable code like this
22
23 ```{r}
24 #| echo: false
25 2 * 2
26 ```
27
28 The `echo: false` option disables the printing of code (only output is displayed).
```

The bottom panel shows the R console output for the first code block:

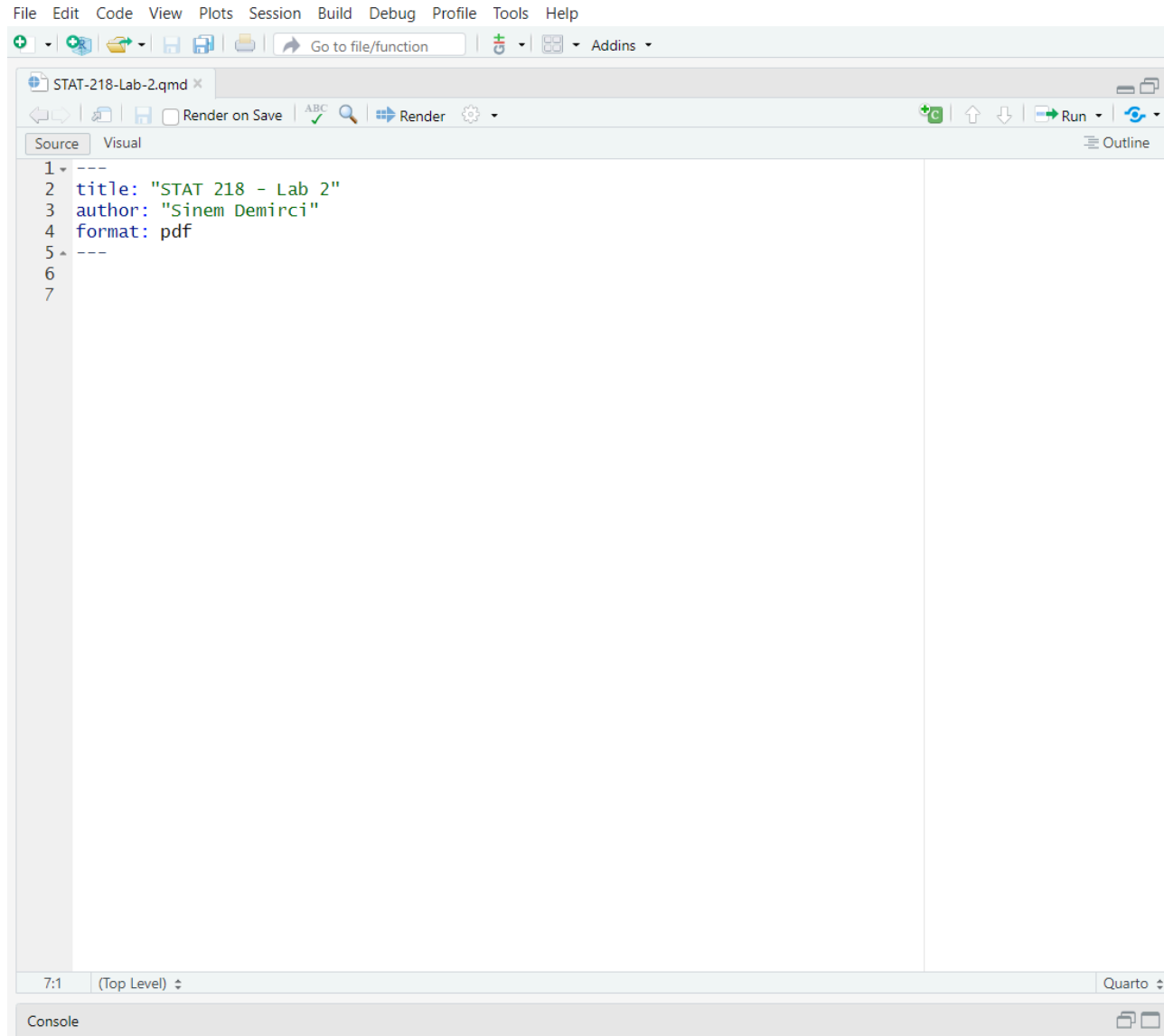
```
R 4.3.1 - C:/Users/sdemirci/OneDrive - Cal Poly/STAT-218/STAT-218-Summer/stat218-summer-24/
Copyright (C) 2023 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

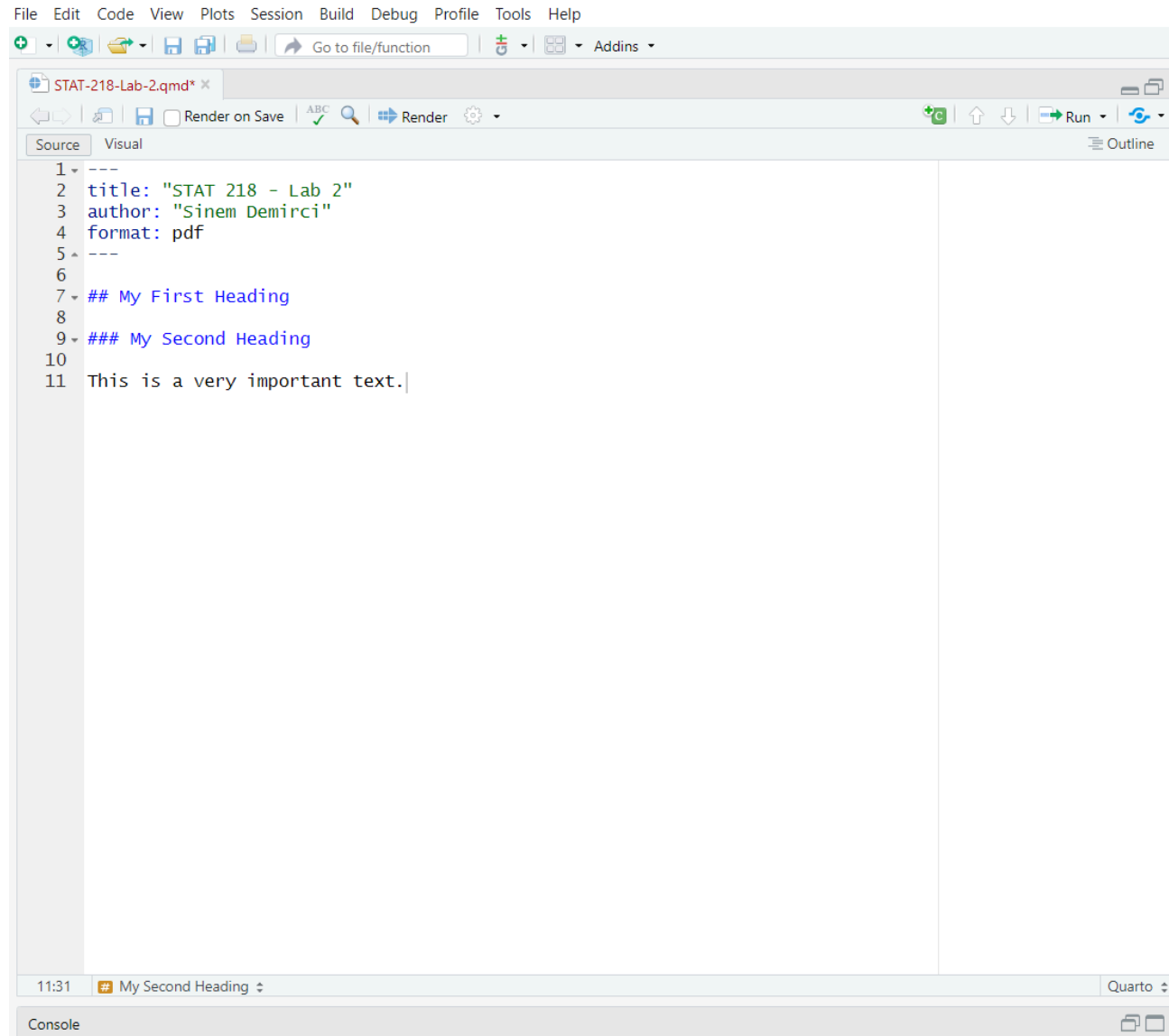
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.
```

Delete The Default Content



```
File Edit Code View Plots Session Build Debug Profile Tools Help
+ [Icons] Go to file/function [Icons] Addins
STAT-218-Lab-2.qmd x
[Icons] Render on Save [Icons] Render [Icons] Run [Icons] Outline
Source Visual
1 ---
2 title: "STAT 218 - Lab 2"
3 author: "Sinem Demirci"
4 format: pdf
5 ---
6
7
7:1 (Top Level) Quarto
Console [Icons]
```

Add Headings and Text

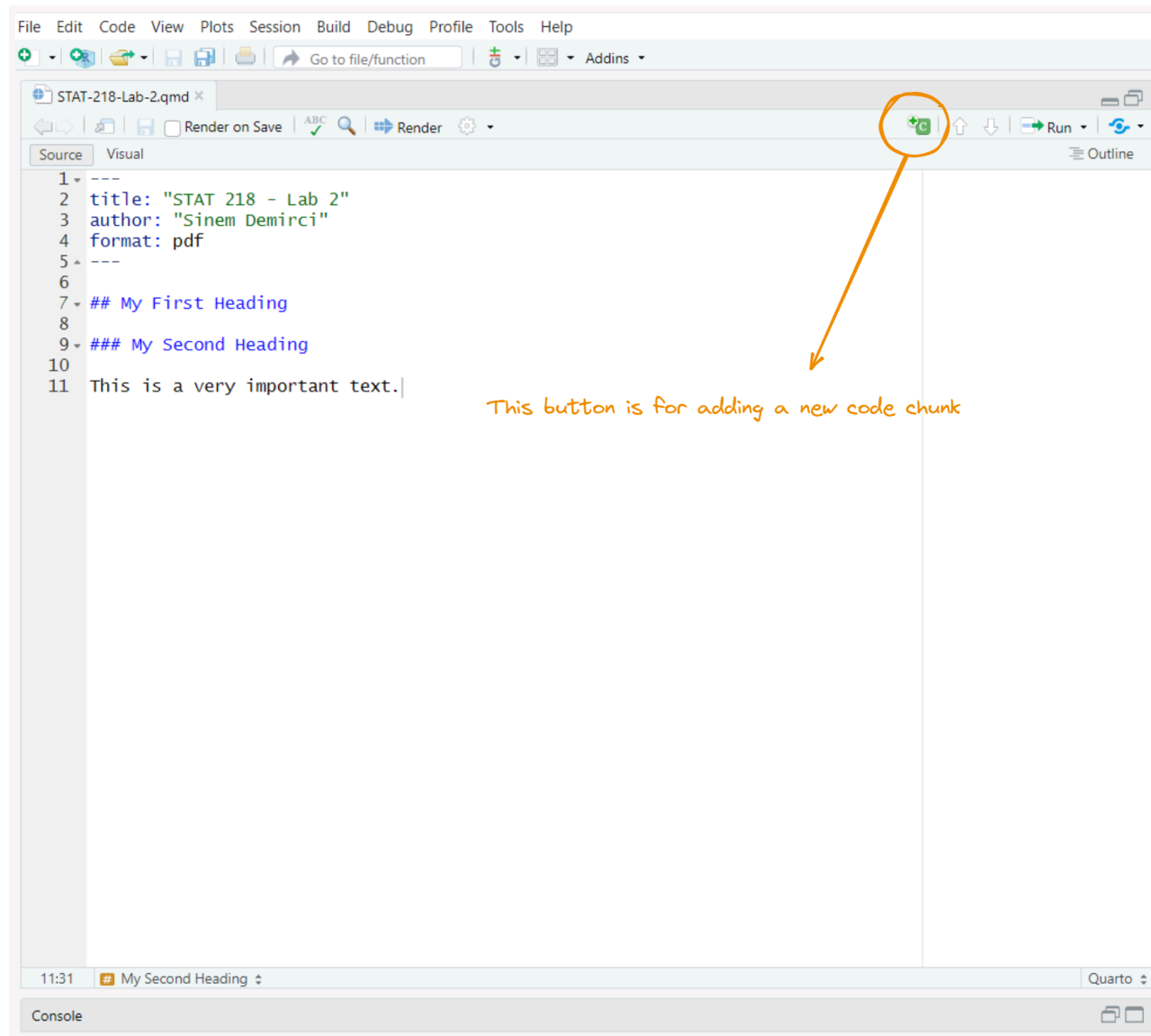


The screenshot shows the RStudio IDE interface with a Quarto document open. The menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. The toolbar contains icons for file operations, a search bar, and a 'Render' button. The document title is 'STAT-218-Lab-2.qmd'. The editor shows the following content:

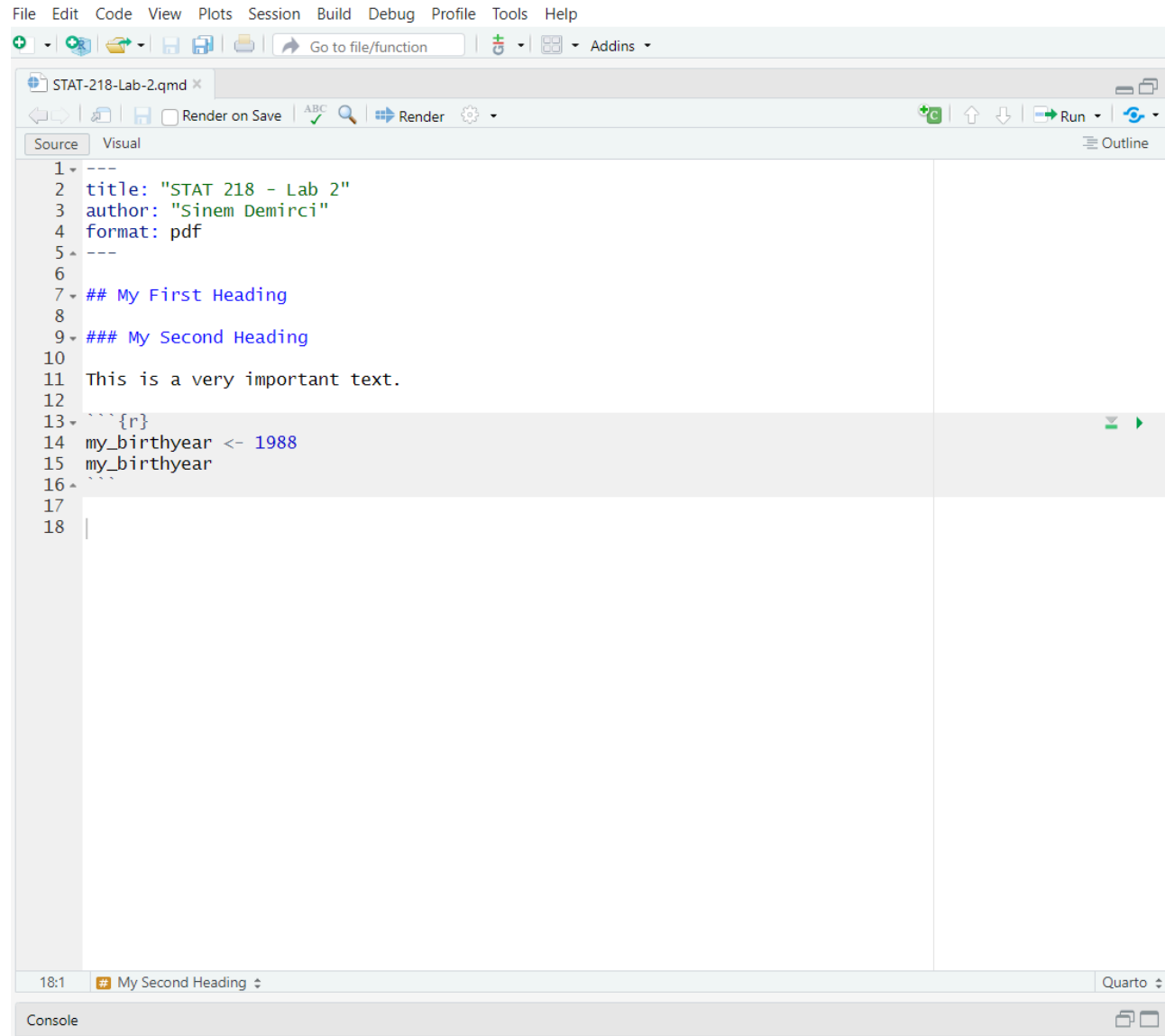
```
1 ---
2 title: "STAT 218 - Lab 2"
3 author: "Sinem Demirci"
4 format: pdf
5 ---
6
7 ## My First Heading
8
9 ### My Second Heading
10
11 This is a very important text.
```

The status bar at the bottom shows the time 11:31, the current heading '## My Second Heading', and the word 'Quarto'.

Add A Code Chunk



Add This Simple Code



```
1 ---
2 title: "STAT 218 - Lab 2"
3 author: "Sinem Demirci"
4 format: pdf
5 ---
6
7 ## My First Heading
8
9 ### My Second Heading
10
11 This is a very important text.
12
13 ```{r}
14 my_birthyear <- 1988
15 my_birthyear
16 ```
17
18 |
```

Creating An Object

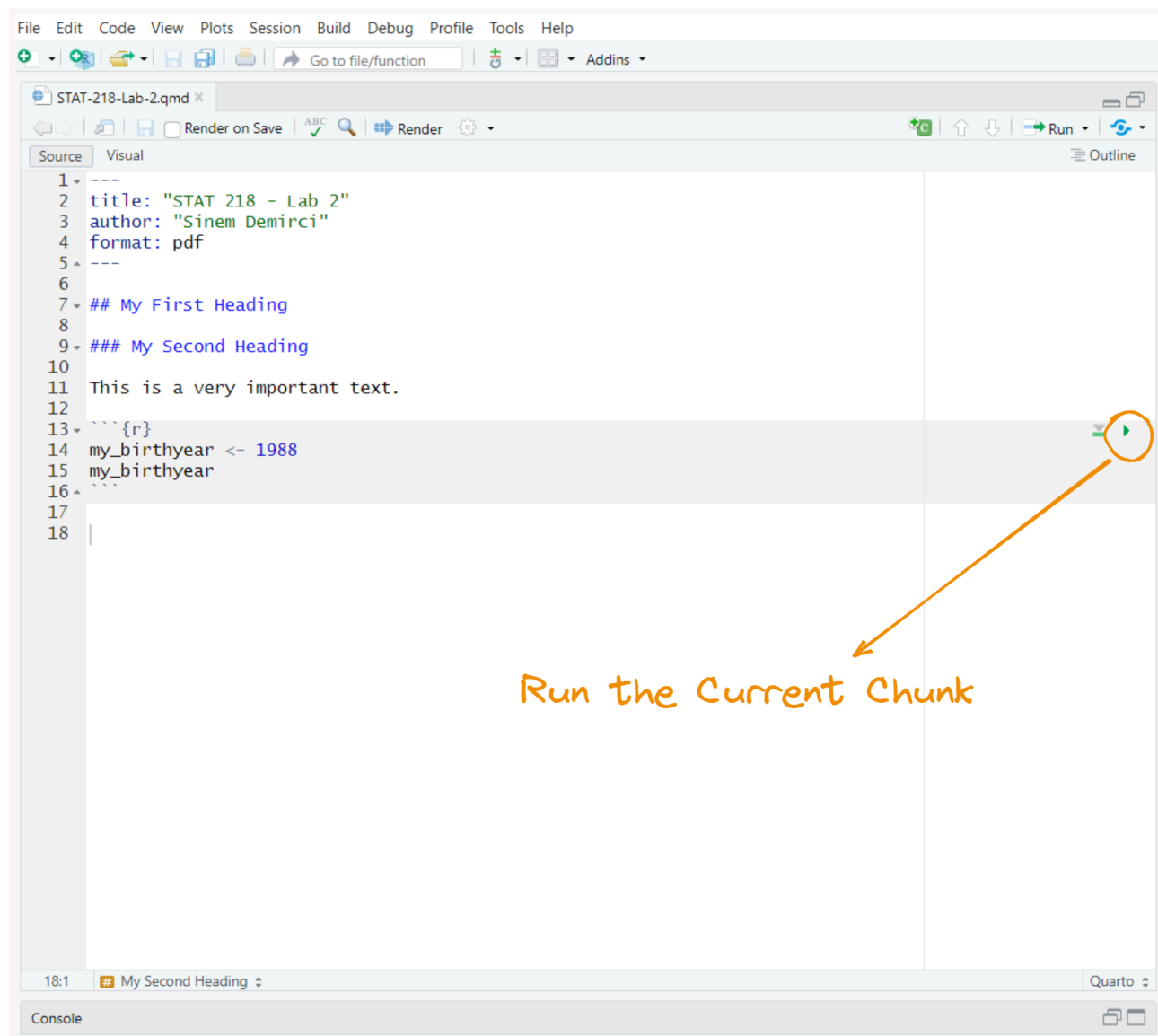
We create an object by using “<-” called as “Object Assignment Operator”

	Windows	Mac
Shortcut	Alt <i>and</i> -	Option <i>and</i> -

```
1 my_birthyear <- 1988
2 my_birthyear
```

```
[1] 1988
```

Run the Code Chunk



Say, Hello World!

- **hello world** is a phrase that most programmers use when they first begin programming in any language.
 - Let's write our first **"hello world!"** together.



The image shows a code editor window with two tabs: 'Source' and 'Visual'. The 'Source' tab is active, displaying a code file with 24 lines. The code is a mix of YAML and R. Lines 1-5 are YAML front-matter. Lines 7-10 are more YAML. Lines 11-14 are R comments. Lines 15-18 are an R code block for setting a variable. Lines 19-21 are R comments. Lines 22-24 are an R code block for printing 'hello world!'. The editor has a line number margin on the left and a gutter with fold/unfold icons on the right. The 'Outline' tab is visible but empty.

```
1 ---
2 title: "STAT 218 - Lab 2"
3 author: "Sinem Demirci"
4 format: pdf
5 ---
6
7 ## My First Heading
8
9
10
11 ### My Second Heading
12
13 This is a very important text
14
15 ```{r}
16 my_birth_year <- 1988
17 my_birth_year
18 ```
19
20 Say Hello world
21
22 ```{r}
23 print("hello world!")
24 ```
```

Vocabulary Section

```
1 do(something)
```

`do()` is a function;

`something` is the argument of the function.


```
1 do(something, colorful) # I can put here a comment by using hashtag
```

`do()` is a function;

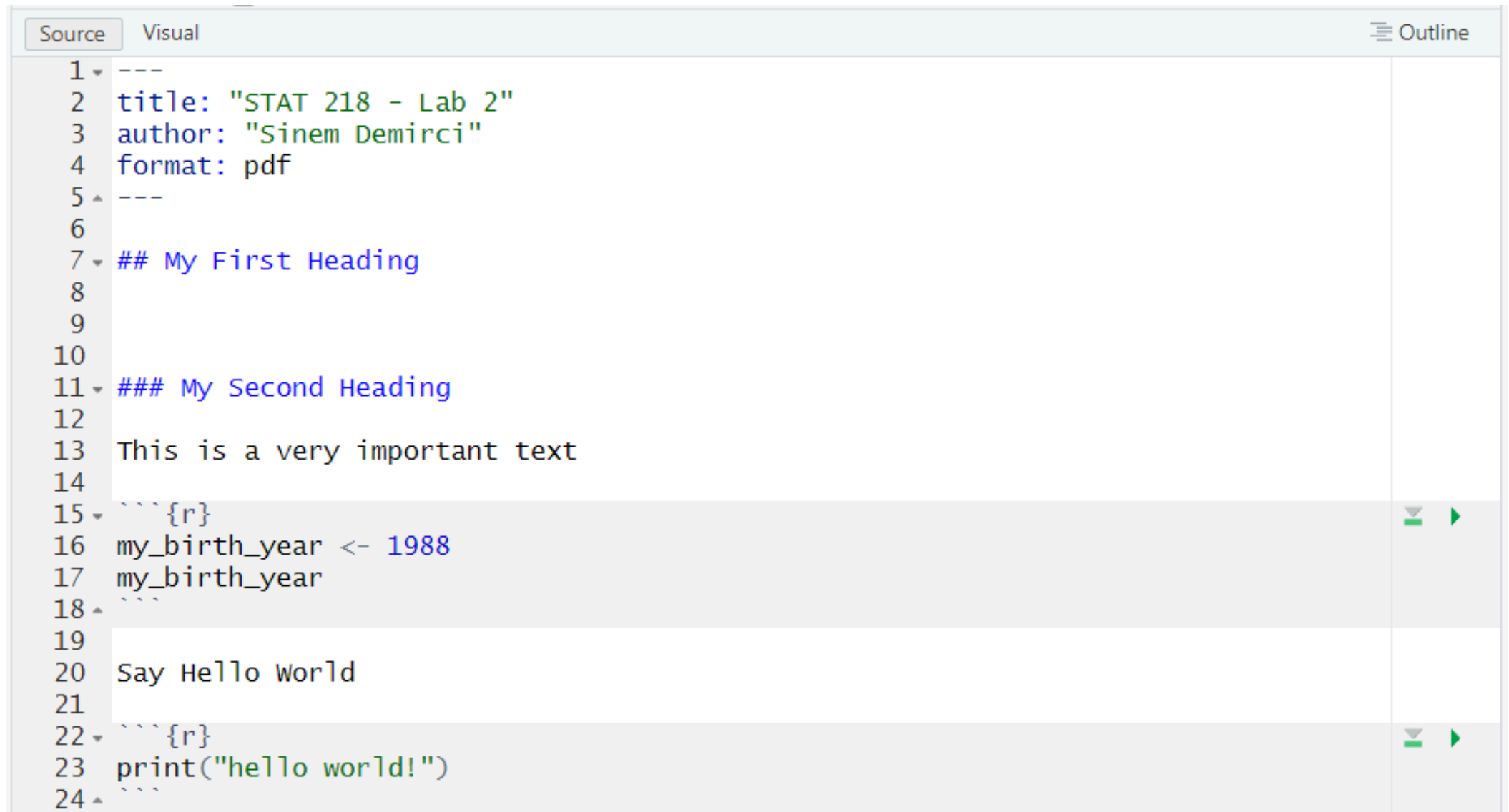
`something` is the first argument of the function;

`colorful` is the second argument of the function.

R ignores comments if you put **#** like above

I love  **Dr. Dogucu's** teaching strategy to teach students the basics of coding. This is how she explains the idea of coding. I am using some of her strategies during this session.

Check Your Document Before Rendering



The image shows a document editor interface with two tabs: 'Source' and 'Visual'. The 'Source' tab is active, displaying a document structure. The document starts with a frontmatter block containing metadata: title 'STAT 218 - Lab 2', author 'Sinem Demirci', and format 'pdf'. This is followed by two headings: '## My First Heading' and '### My Second Heading'. The main content includes a paragraph 'This is a very important text', a code block for R code, and a text block 'Say Hello World'. The code block contains two lines of R code: `my_birth_year <- 1988` and `my_birth_year`. The text block contains the text 'Say Hello World'. The document ends with another code block containing the R code `print("hello world!")`. The 'Visual' tab is currently empty. The 'Outline' panel on the right shows the document structure with expand/collapse icons.

```
1 ---  
2 title: "STAT 218 - Lab 2"  
3 author: "Sinem Demirci"  
4 format: pdf  
5 ---  
6  
7 ## My First Heading  
8  
9  
10  
11 ### My Second Heading  
12  
13 This is a very important text  
14  
15 ```{r}  
16 my_birth_year <- 1988  
17 my_birth_year  
18 ```  
19  
20 Say Hello World  
21  
22 ```{r}  
23 print("hello world!")  
24 ```
```

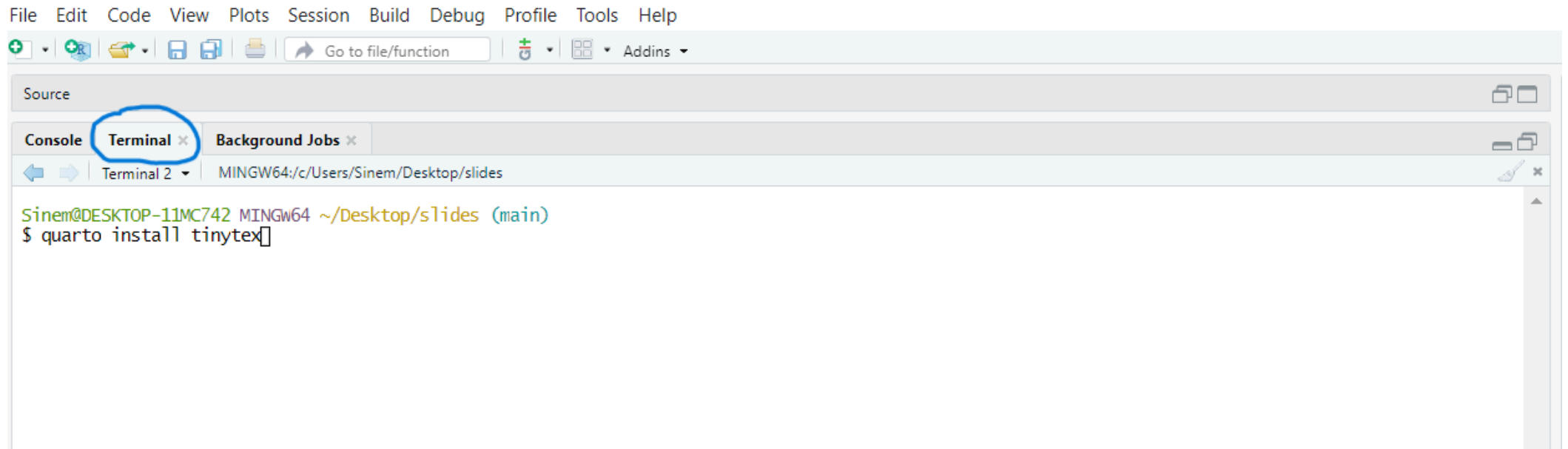
Rendering a PDF Document

- The Quarto document that we created is a *source file*.
- By rendering this, will have a different *output file* (e.g., PDF)

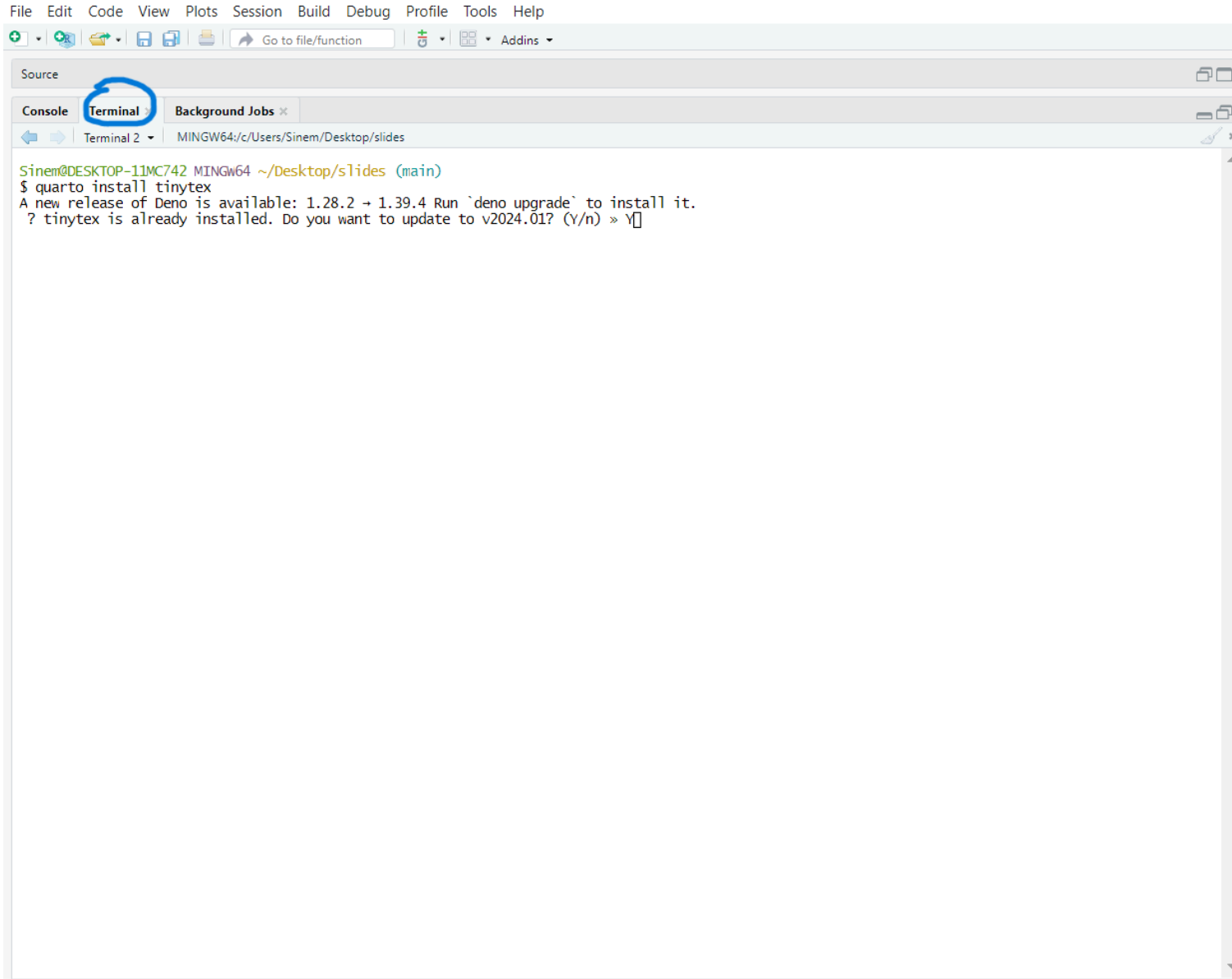
Rendering a PDF Document

Open your terminal pane and type the following:

```
1 quarto install tinytex
```



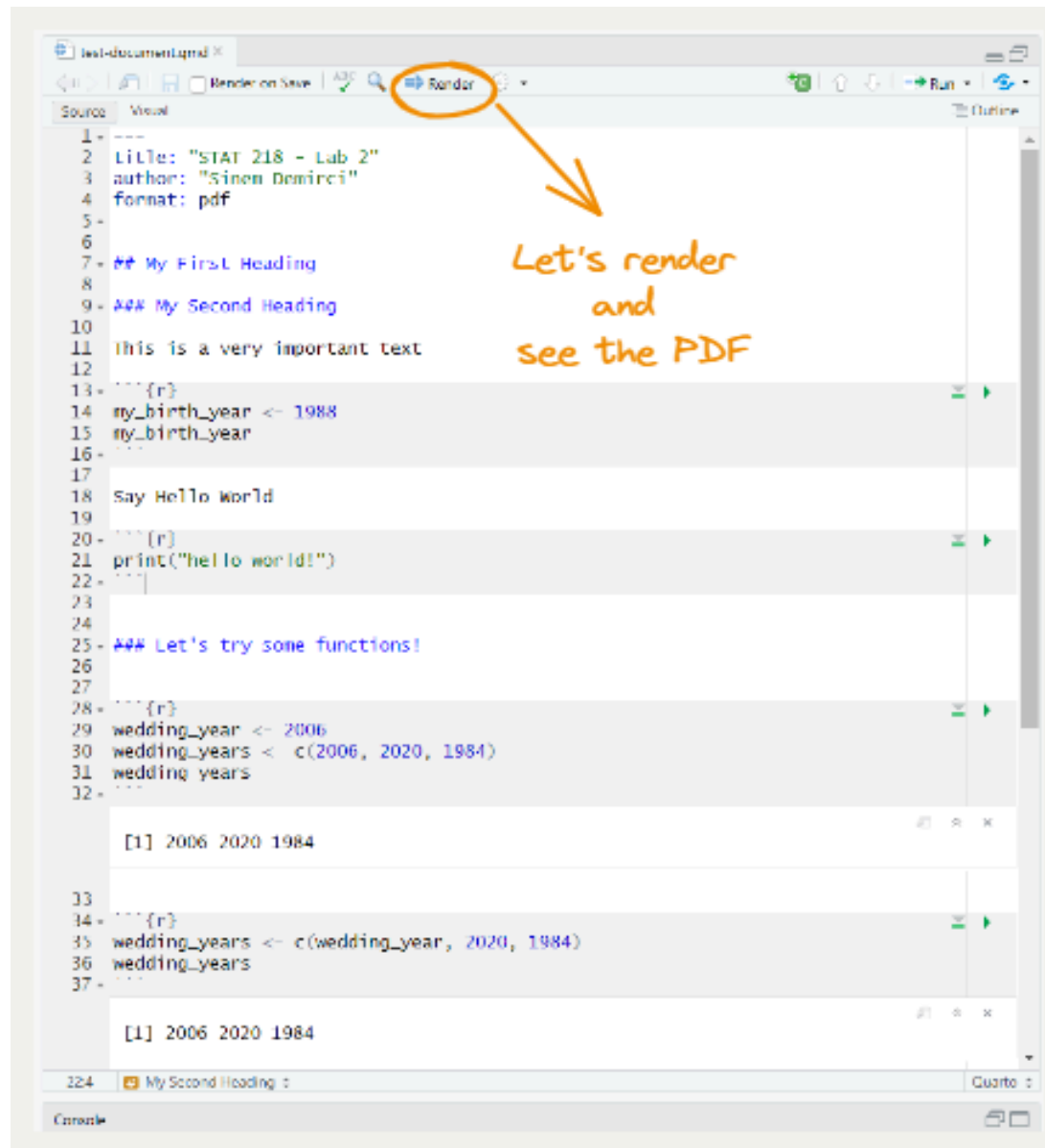
Rendering a PDF Document



The screenshot shows the Quarto IDE interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. Below the menu is a toolbar with icons for running, saving, and other actions. The main workspace is divided into three panels: Source, Console, and Terminal. The Terminal panel is active and shows a command prompt session. The command `$ quarto install tinytex` has been executed, resulting in a message about Deno and a confirmation prompt for updating tinytex. The prompt is currently showing `Y`.

```
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Source
Console Terminal Background Jobs
Terminal 2 MINGW64:/c/Users/Sinem/Desktop/slides
Sinem@DESKTOP-11MC742 MINGW64 ~/Desktop/slides (main)
$ quarto install tinytex
A new release of Deno is available: 1.28.2 -> 1.39.4 Run 'deno upgrade' to install it.
? tinytex is already installed. Do you want to update to v2024.01? (Y/n) » Y
```

Rendering a PDF Document



Rendering a PDF Document

STAT 218 - Lab 2

Sinem Demirci

My First Heading

My Second Heading

This is a very important text

```
my_birth_year <- 1988  
my_birth_year
```

```
[1] 1988
```

Say Hello World

```
print("hello world!")
```

```
[1] "hello world!"
```

Lab Assignment 0

- Please upload this PDF document to our Canvas page as **LAB Assignment 1 (Individual)**
- Beginning from next week, we will start working in groups.

CONGRATULATIONS

Now, you can close your RStudio.

Everything you did is in your STAT 218 folder!