Introduction to Quarto

Justin Smith

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Basics

What is Quarto?

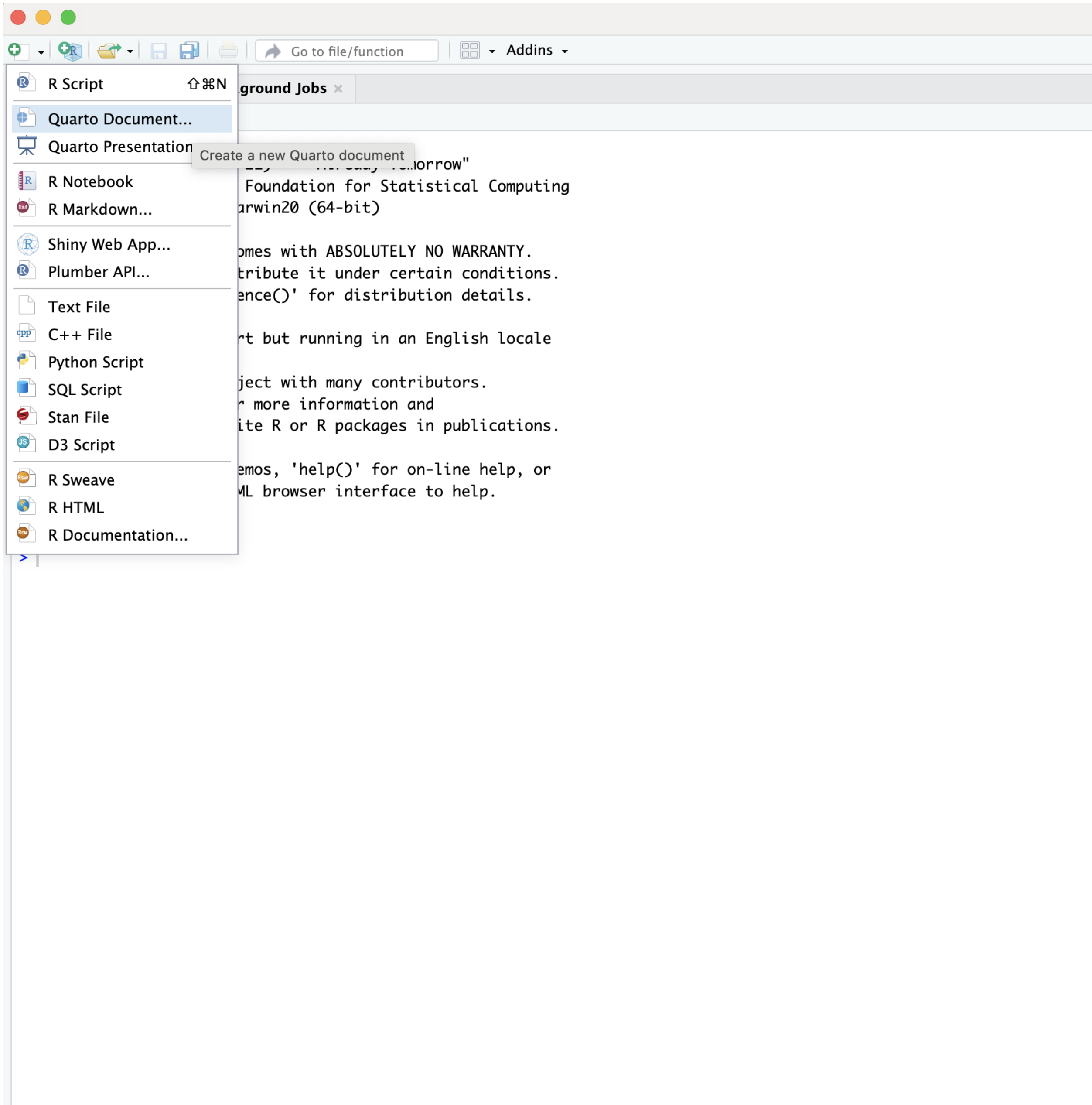
- **Quarto** is a technical document publishing system
- It is ideally suited to situations where
  - There is technical analysis
  - The author wants easy reproducibility
  - You want to easily change between output formats
- It weaves together both the document text and code
  - We will use **R** for code
  - You can also use **Python**, **SQL**, **Julia**, **Stata**, etc.
- Almost identical to RMarkdown

Downloading and Installing Quarto

- Make sure that you have downloaded and installed **R** and **RStudio**
  - You can use **Quarto** in other programs too, but we will use **RStudio**
- Download **Quarto** here: https://quarto.org/docs/get-started/
- Install the program
- It will automatically be integrated with **RStudio**
- **Important**: To create PDFs, you need to also install a Tex
  - For PCs: https://miktex.org
  - For Macs: https://tug.org/mactex/

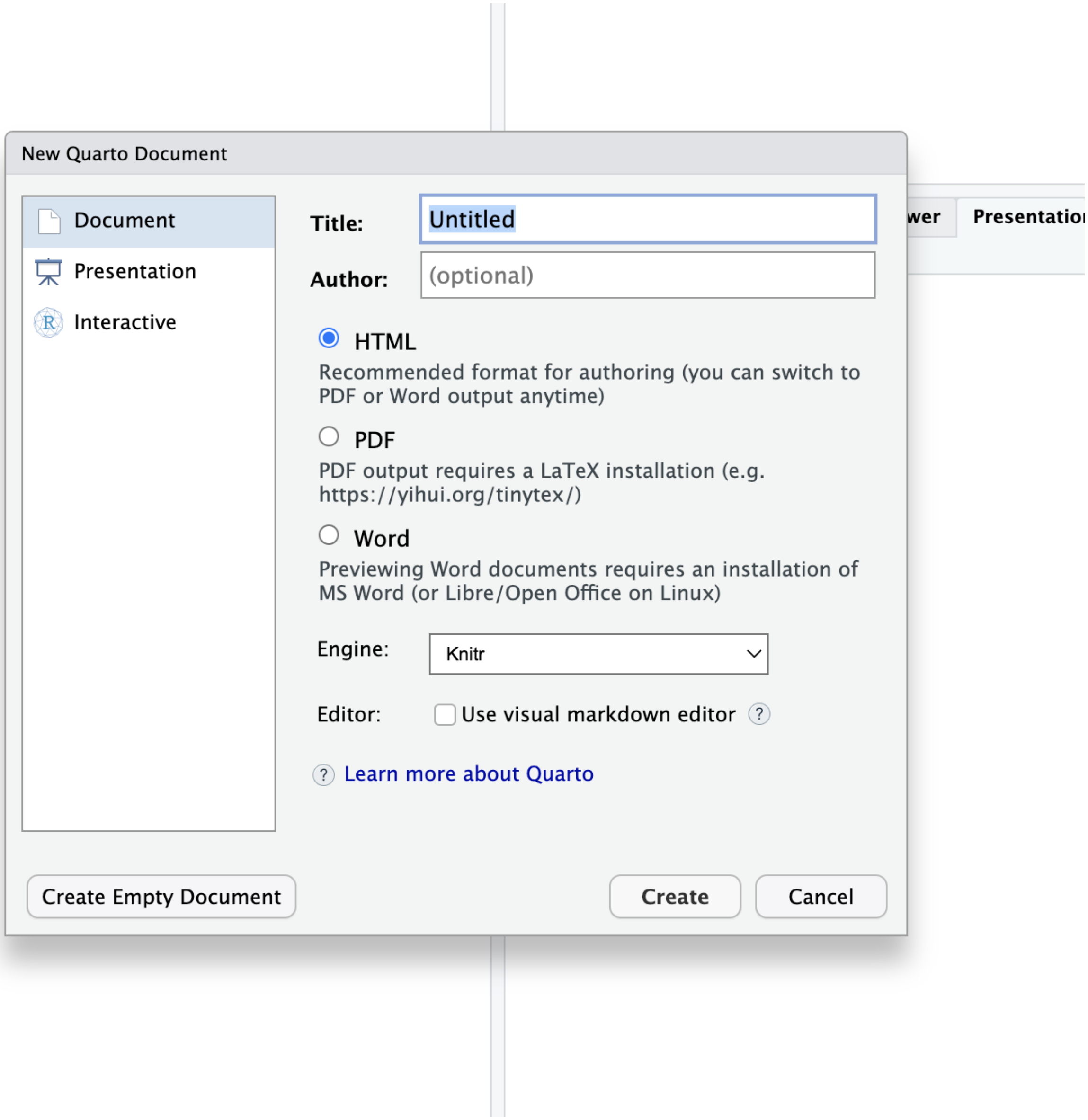
Opening a New Document

- To create a new Quarto document, navigate to the page icon in the toolbar
- Click on it and select “Quarto Document”



```
                              orrow"
 Foundation for Statistical Computing
arwin20 (64-bit)

omes with ABSOLUTELY NO WARRANTY.
tribute it under certain conditions.
ence()' for distribution details.

rt but running in an English locale

ject with many contributors.
r more information and
ite R or R packages in publications.

emos, 'help()' for on-line help, or
ML browser interface to help.

>
```

- A window with a set of options will pop up
  - Leave “Document” selected
  - You can title your document and set author if you wish, but this can be changed later
  - Below you can select whether you want to output your document as HTML, PDF, or Word
  - For our class, choose PDF
  - Click “Create”


New Quarto Document

Document
Presentation
Interactive

Title: Untitled

Author: (optional)

● HTML
Recommended format for authoring (you can switch to PDF or Word output anytime)

○ PDF
PDF output requires a LaTeX installation (e.g. https://yihui.org/tinytex/)

○ Word
Previewing Word documents requires an installation of MS Word (or Libre/Open Office on Linux)

Engine: Knitr

Editor: □ Use visual markdown editor ?

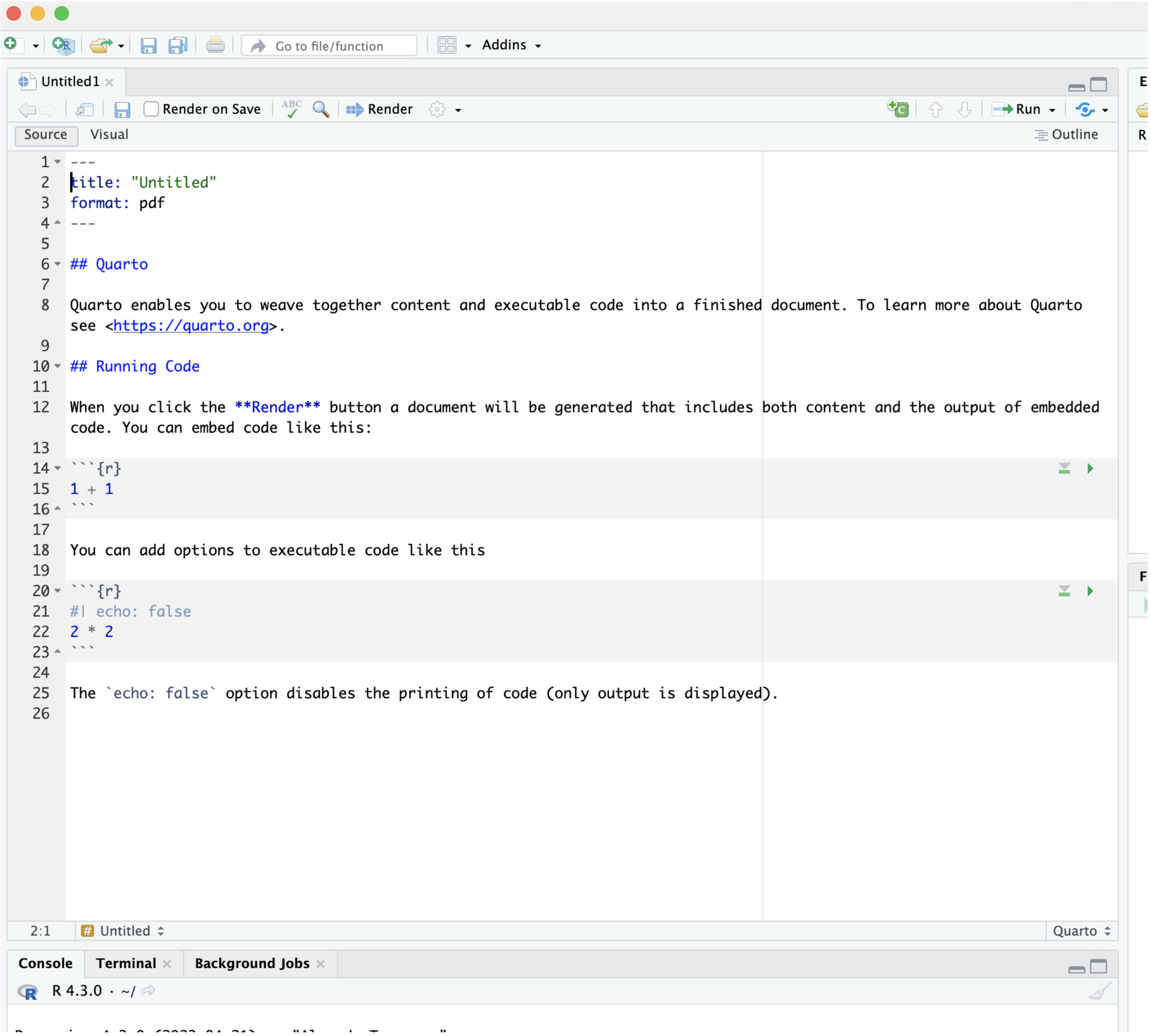
? Learn more about Quarto

- A new template document will pop up in RStudio
  - It will have a ".qmd" extension
  - This stands for Quarto Markdown

Elements of a Quarto Document

Introduction

- The template will look as follows
  - Note that it is customized slightly based on the options you selected previously

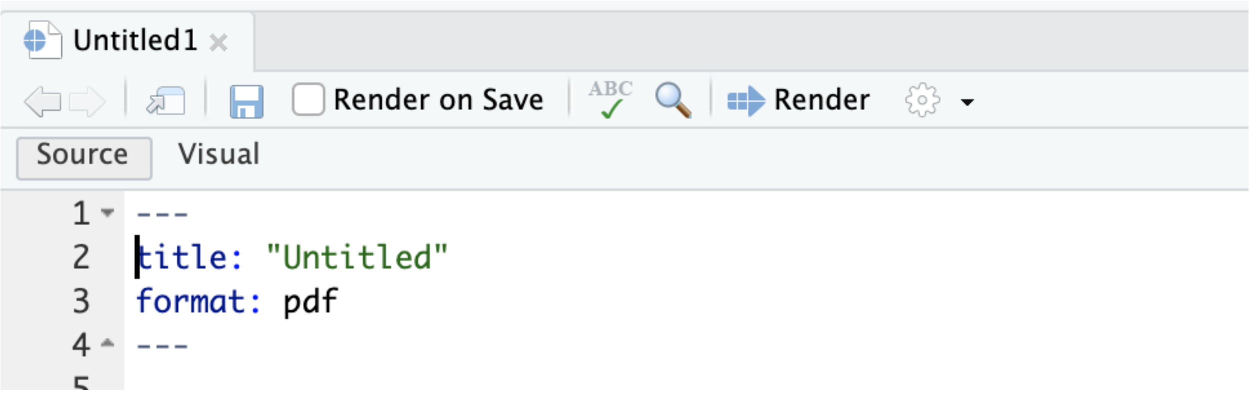


~~~
---
title: "Untitled"
format: pdf
---

## Quarto

Quarto enables you to weave together content and executable code into a finished document. To learn more about Quarto
see <https://quarto.org>.

## Running Code

When you click the **Render** button a document will be generated that includes both content and the output of embedded
code. You can embed code like this:

```{r}
1 + 1
~~~

You can add options to executable code like this

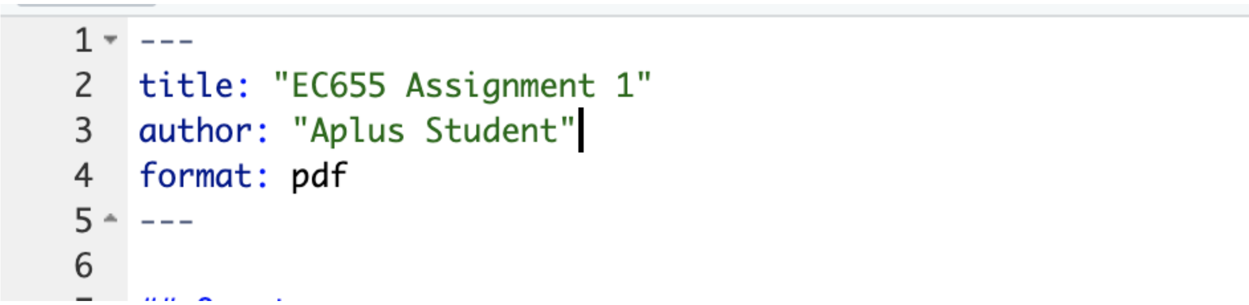
```{r}
#| echo: false
2 * 2
```

The `echo: false` option disables the printing of code (only output is displayed).
```

- The template has enough to compile a simple document
- There are several important components to be aware of

YAML

- The code at the top between the dashes is called **Yet Another Markup Language (YAML)**
```



```
---
title: "Untitled"
format: pdf
---
```

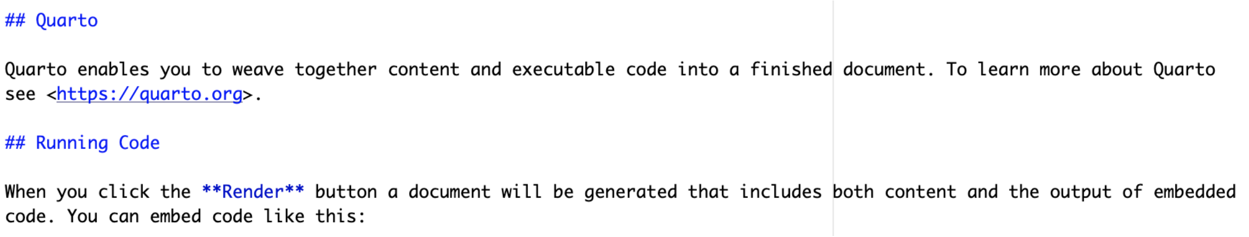
- It sets a wide variety of options to configure your document
    - Title
    - Author
    - Output format
    - Aesthetics
    - Many other behaviours
- YAML is complex and you will likely need to google options
- Its structure is based on indentation
    - Top level options are left-justified
    - Sub-options are indented
- It is case-sensitive and whitespace-sensitive, so can be finicky
- For now set only the title, author, and format



```
---
title: "EC655 Assignment 1"
author: "Aplus Student"
format: pdf
---

```

Text

Markdown



```
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```
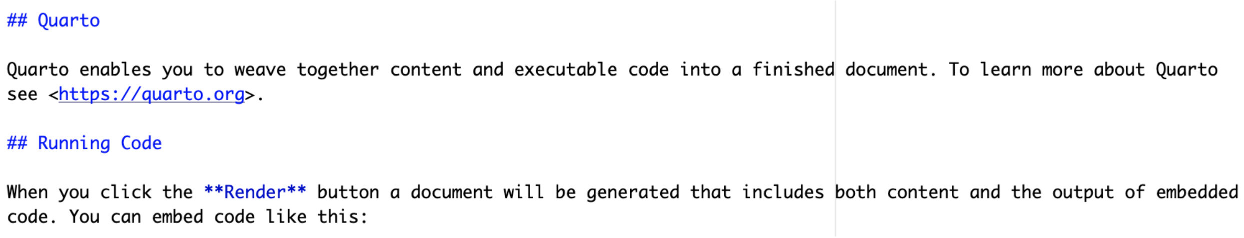

- Typically you then add some text to your document

- Documents in **Quarto** use **Markdown** syntax
    - **Markdown** is language that formats plain text documents
- This will likely be new to you
- I suggest you have a cheat sheet open while you start writing in this format
- Here is a good one: https://www.markdownguide.org/basic-syntax/

Headings



```
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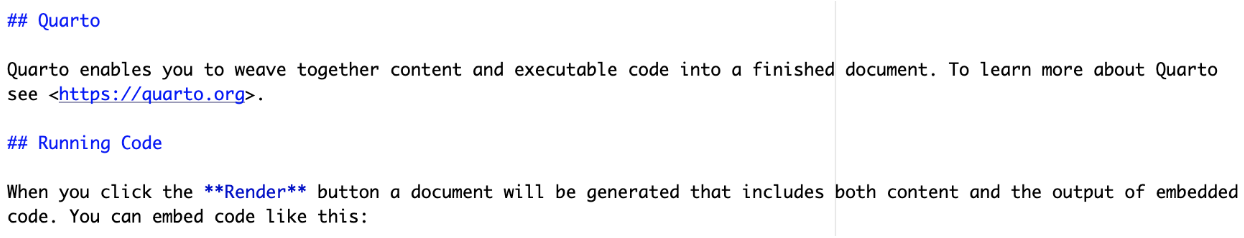
- Headings are created with hashtags
- Higher heading “levels” use more hashtags
    - The higher the heading level, the smaller the font
- The template document starts with level 2 headings
    - You could also use a level 1 heading to make the font larger
- Adding a new heading will automatically separate different elements of your document

Body Text



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code. You can embed code like this:
```

- Below the heading is some plain text
    - This is the main content of your document
- You only need to type out the plain text
- Quarto will automatically format the look of the document based on YAML
- Some options to format the text include
    - Put a single * on each side of the word to *italicize*
    - Put two * on each side of a word to **boldface** text

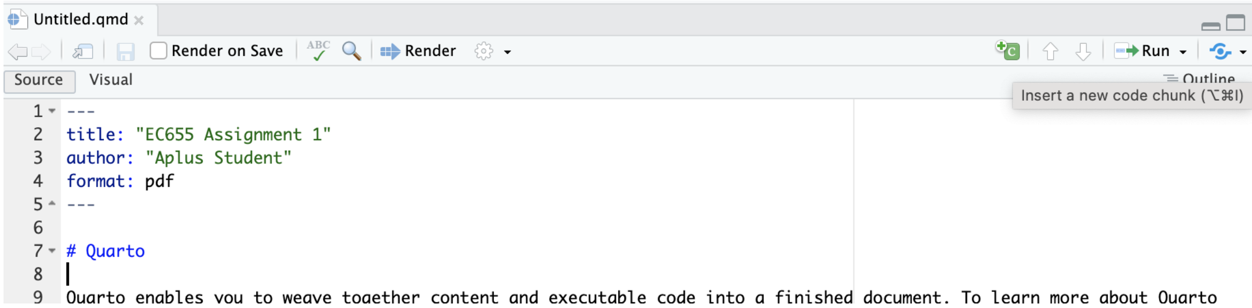
Code Chunks

Basics

- One of the main benefits of Quarto is you can put the code right in the document
- The code does not appear as one large set of code

- Instead, chunks of code appear where you want the output placed in the document
- When Quarto encounters a code chunk, it executes it and places the output in the document
    - You can customize it to include or hide the code itself
    - There can be code chunks that are not executed
    - The output can be customized

Adding a Code Chunk



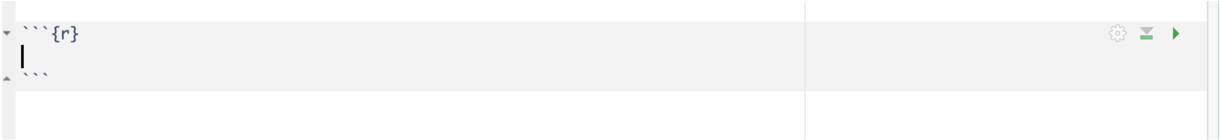
```
---
title: "EC655 Assignment 1"
author: "Aplus Student"
format: pdf
---

# Quarto

Quarto enables you to weave together content and executable code into a finished document. To learn more about Quarto
```

- To add a new code chunk first place the cursor in your document to where you want the code
- Then click on the green box in the top right of the toolbar
- A grey-shaded box will appear in the document

Elements of a New Code Chunk

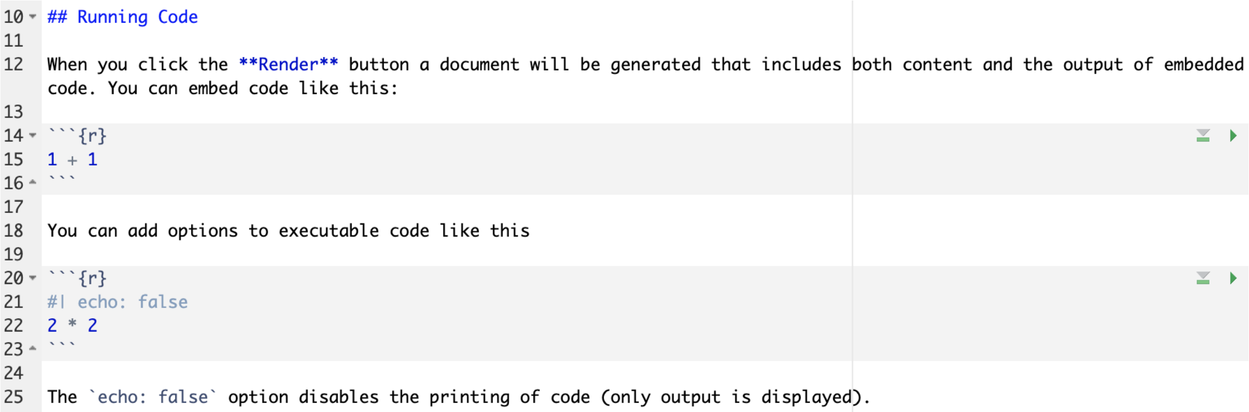


~~~
```{r}

```
~~~

- **R** adds a basic box that will contain the code you add later
- The three apostrophes in the top and bottom delineate the code space
- The **{r}** indicates that the code is executed in **R**
- You add any **R** code you want executed in this part of the document

Adding Code



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```{r}
1 + 1
```

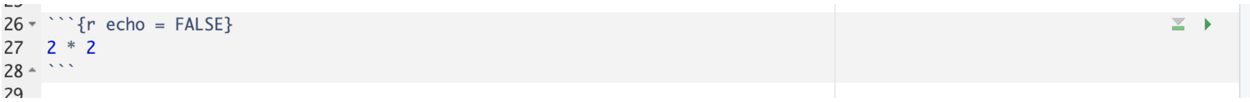
You can add options to executable code like this

```{r}
#| echo: false
2 * 2
```

The `echo: false` option disables the printing of code (only output is displayed).
~~~

- The **Quarto** template is populated with two basic code chunks

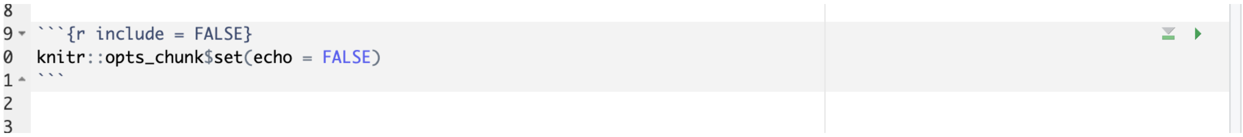
- The first simply adds $1 + 1$
- When you render your document, the following will happen with that chunk
  - It executes the code in **R**
  - It adds the result of the code and the code itself to the document in that spot in the text
- If you do not want the code itself, you can tell **Quarto** to hide it
- The second set of code does that with "#| echo: false"
- You can also set this option in the curly braces



~~~
```{r echo = FALSE}
2 * 2
```
~~~

Setting Options in Code Chunks

- In some applications, you may not want any code to appear in the document
- You can set this option globally rather than in each chunk
- Let us add this option to the first code chunk we created previously

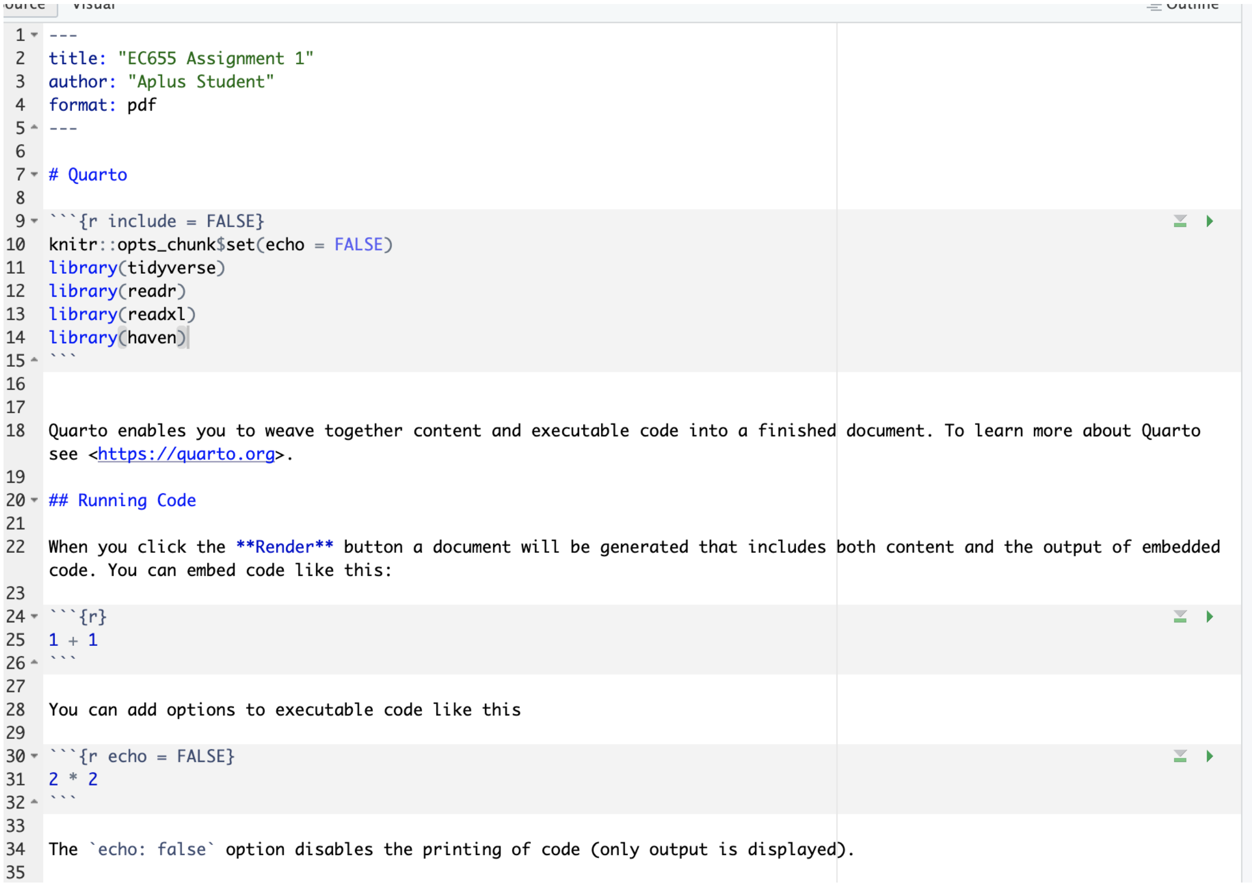


~~~
```{r include = FALSE}
knitr::opts_chunk$set(echo = FALSE)
```
~~~

- `knitr` is the **R** package that compiles the document
- This option will remove the code from the output of each code chunk
- Note we have added the option `include = FALSE`
  - This hides the code and the results from the output file
  - Still executes the code in the background
- If you want to display code and results in later chunks, you can set `echo = TRUE`

Loading Packages in Code Chunks

- Remember that **R** uses functions contained in *packages*
- You can load packages as needed in code chunks
- Typically it's easier to load them all together in a chunk at the beginning of the document
- For example we can load some common packages as follows



~~~
---
title: "EC655 Assignment 1"
author: "Aplus Student"
format: pdf
---

# Quarto

```{r include = FALSE}
knitr::opts_chunk$set(echo = FALSE)
library(tidyverse)
library(readr)
library(readxl)
library(haven)
```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```{r}
1 + 1
```

You can add options to executable code like this

```{r echo = FALSE}
2 * 2
```

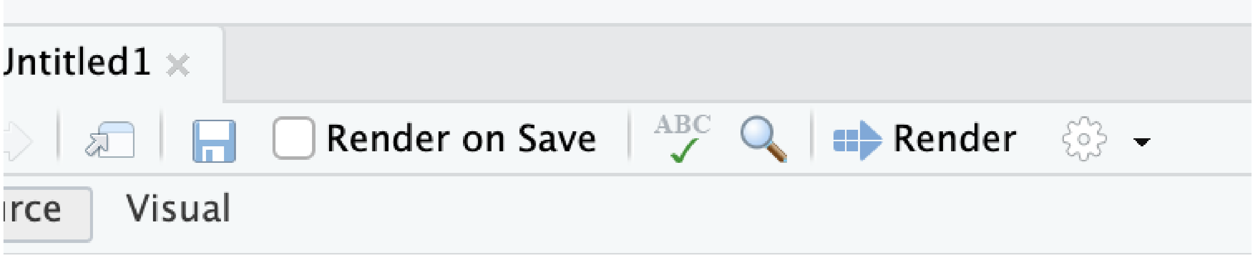
The `echo: false` option disables the printing of code (only output is displayed).

~~~

- Recall that in this code chunk we have hidden the code and results
    - Libraries are loaded in the background

Rendering the document

- When you have all the content ready, you can render the output
- Recall that we selected PDF as our output type
- To render the document, click the **Render** button on the toolbar


Jntitled1
Render on Save
ABC
Render
rce
Visual