

# RStudio

## Working with R – RStudio

RStudio is an Integrated Development Environment (IDE) for R and it helps you:

- write code - makes suggestions
- view the output of your code, including plots
- find errors
- manage files
- view documentation

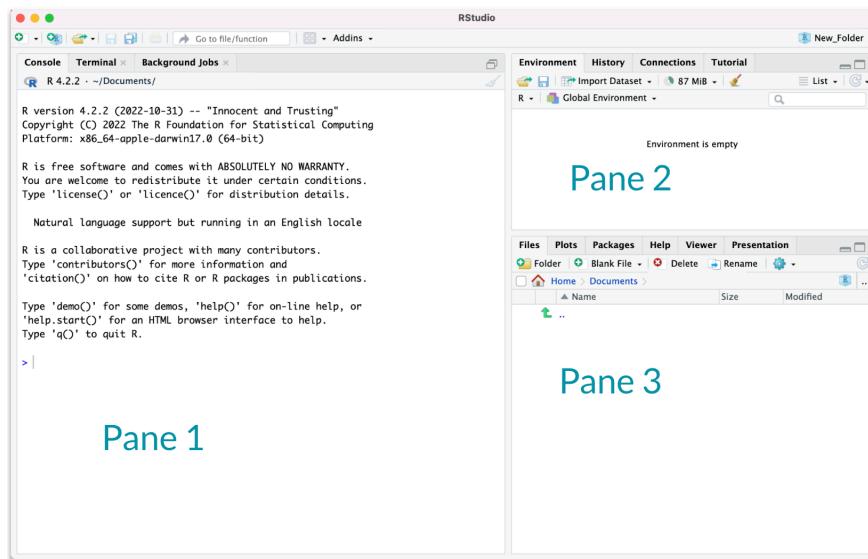


[source]

RStudio used to be the name of a company that is now called Posit.

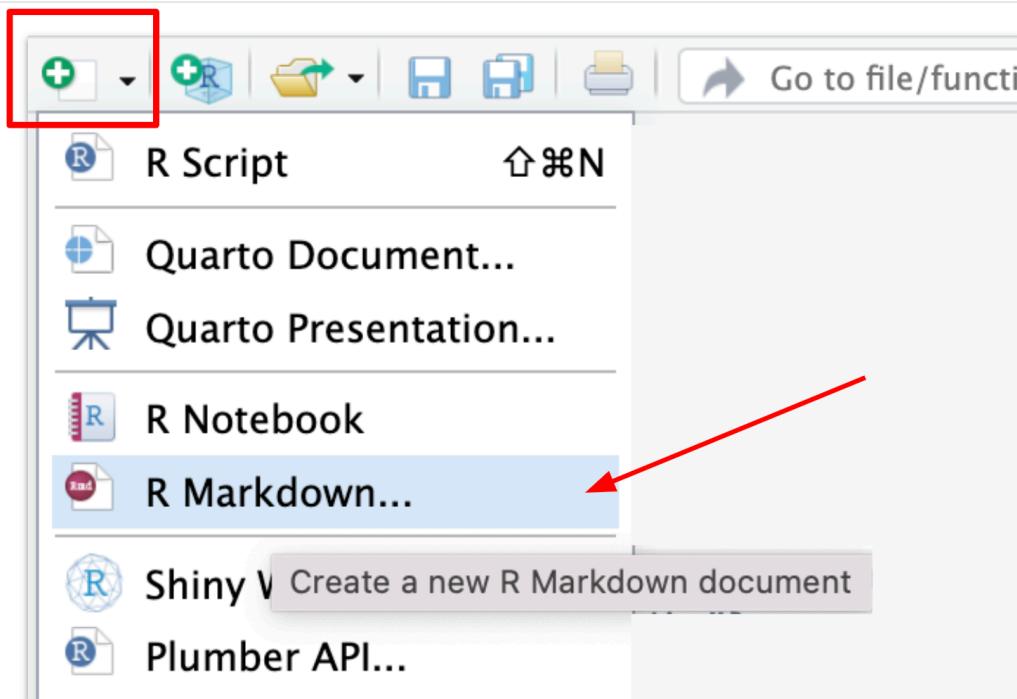
## RStudio

First it is important to be familiar with the layout. When you first open RStudio, you will see 3 panes.



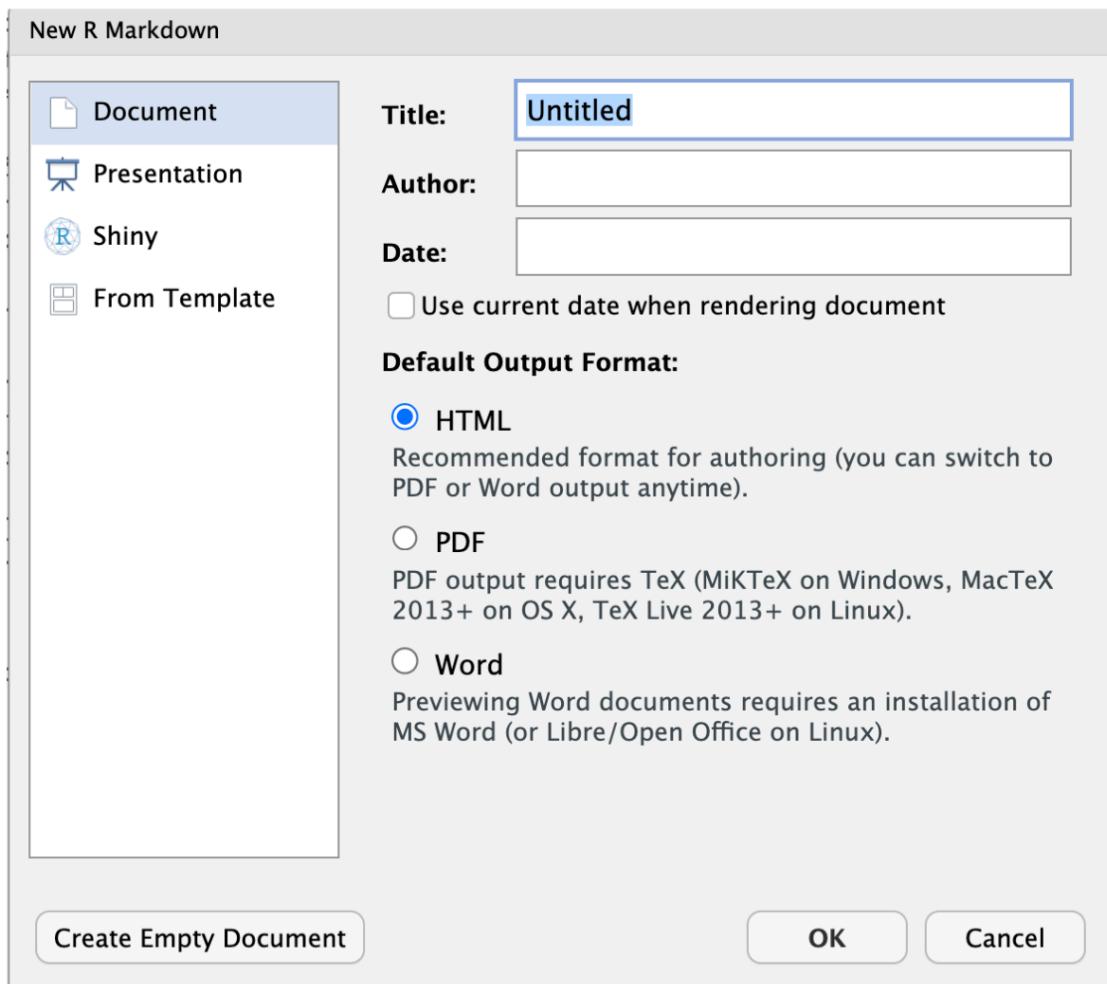
## Hidden Pane

To save a copy of your code. You must open a file first - this will open a 4th pane. These files include Scripts or what are called R Markdown files.



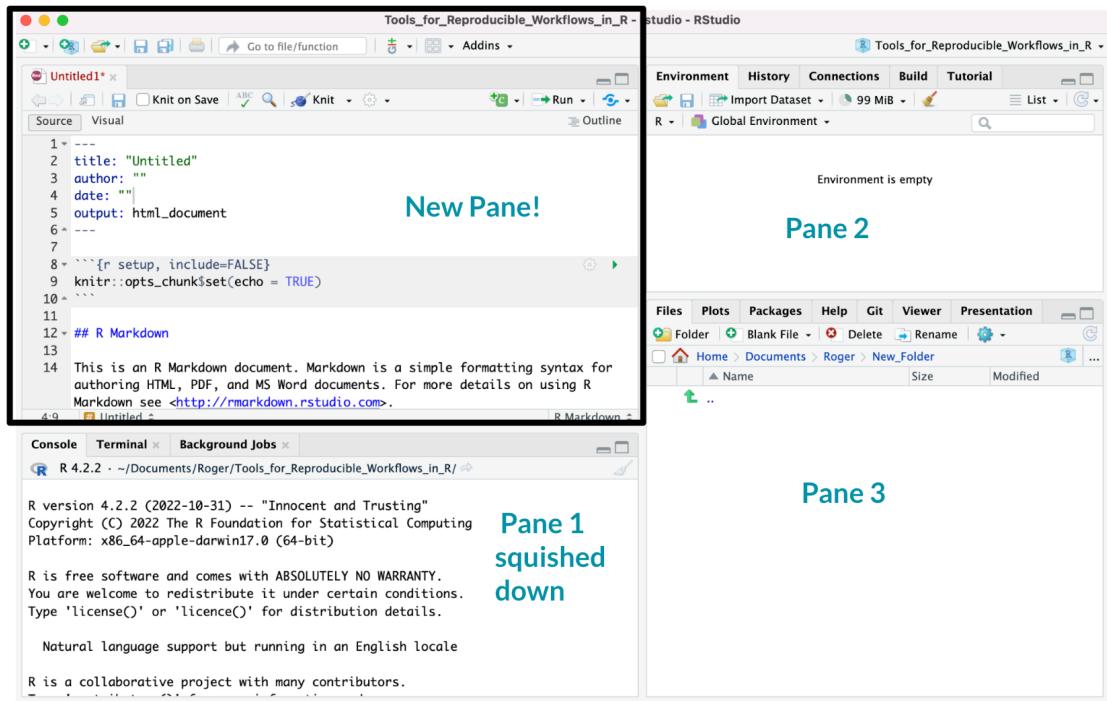
## Hidden Pane

You will see a popup that you can just say “OK” to for now.



## Hidden Pane

Nice! now we have a place to save code! This is where we will mostly be working.



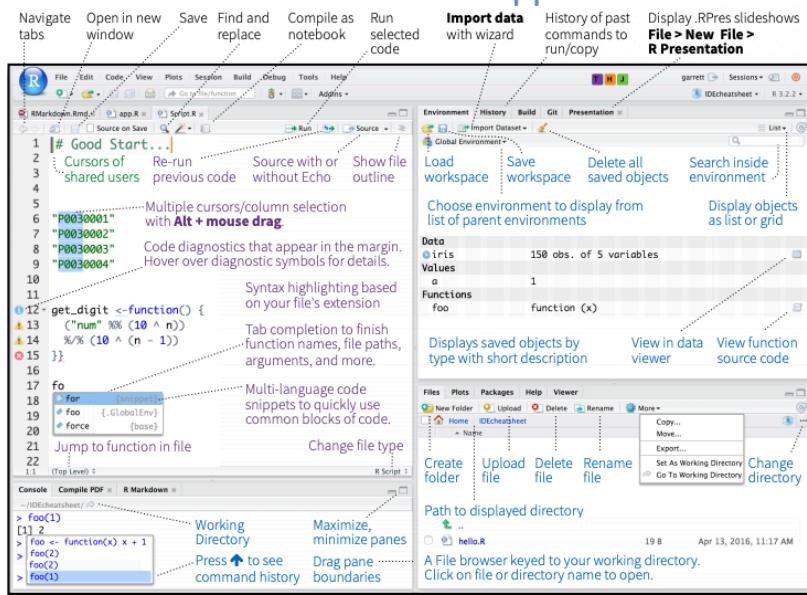
## Working with R in R Studio - 2 major panes:

- 1) The **Source/Editor**:
  - Top by default
  - **saves your code**
- 2) The **R Console**:
  - Bottom by default
  - Calculator
  - Place to try things out, then add to your editor
  - **doesn't save your code**

## RStudio

Super useful “cheatsheet”: [LINK](#)

## Write Code



## R Support

### R Markdown files look different from scripts

It will look like this with text in it.

The screenshot shows the RStudio interface with an R Markdown document open in the left pane and the Global Environment in the right pane.

**Untitled1**

```

1 ---  
2 title: "first_markdown"  
3 output: html_document  
4 ---  
5  
6 `r setup, include=FALSE`  
7 knitr::opts_chunk$set(echo = TRUE)  
8 ---  
9  
10 ## R Markdown  
11  
12 This is an R Markdown document. Markdown is a simple formatting syntax for  
13 authoring HTML, PDF, and MS Word documents. For more details on using R  
14 Markdown see http://rmarkdown.rstudio.com.  
15  
16 `r cors`  
17 first_markdown
```

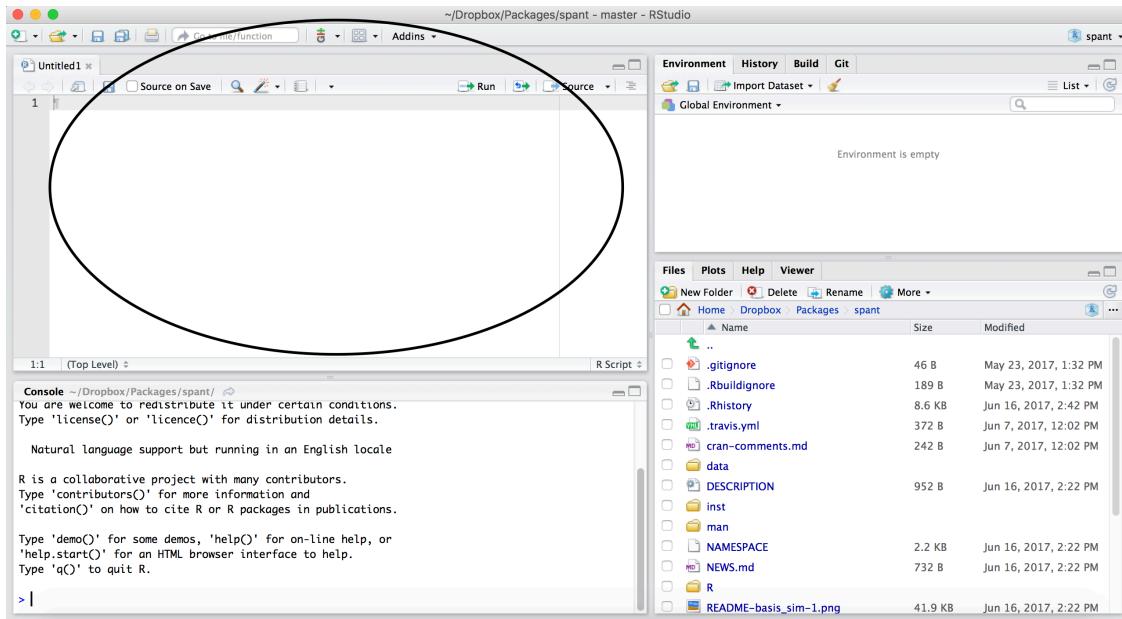
**Environment**

Environment is empty

**Files**

Name	Size	Modified
.gitignore	245 B	May 18, 2021, 12:11 PM
.Rbuildignore	16 B	May 18, 2021, 12:11 PM
.Rhistory	43 B	Jun 10, 2021, 12:11 PM
.travis.yml	666 B	Jun 9, 2021, 12:11 PM
all_functions.xlsx	13.4 KB	Jun 8, 2021, 12:11 PM
all_the_functions.csv	57.3 KB	Jun 8, 2021, 12:11 PM
all_the_packages.txt	211 B	May 18, 2021, 12:11 PM
Arrays_Split		
Basic_R		
Best_Model_Coefficients.csv	587 B	May 18, 2021, 12:11 PM
Best_Model_Coefficients.xlsx	3.8 KB	May 18, 2021, 12:11 PM
bibliography.bib	599 B	May 18, 2021, 12:11 PM
black_and_white_theme.pdf	45.1 KB	May 18, 2021, 12:11 PM
bloomberg logo_email_horizontal	254 KB	May 18, 2021, 12:11 PM

## Scripts will just be empty

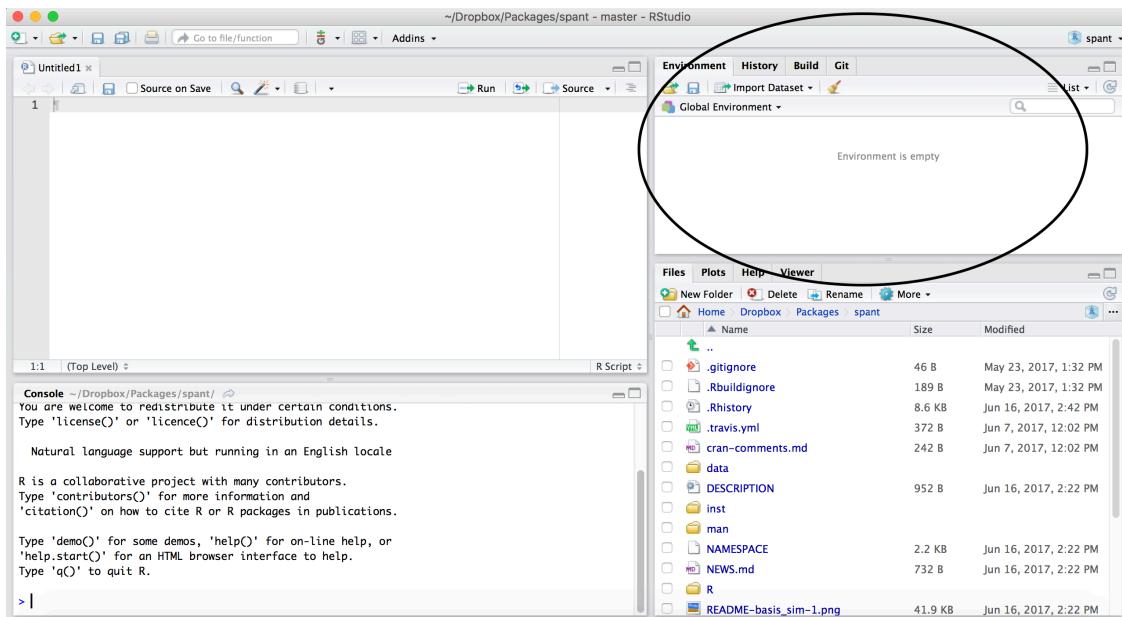


## Scripts and R Markdown

Although people will use scripts often, and they are good for more programmatic purposes, we generally don't recommend them for Public Health Researchers.

For data analyses, R Markdown files are generally superior because they allow you to check your code and write more info about your code.

## Workspace/Environment



## Workspace/Environment

- Tells you what **objects** are in R
- What exists in memory/what is loaded?/what did I read in?

## History

- Shows previous commands. Good to look at for debugging, but **don't rely** on it.  
Instead use RMarkdown!
- Also type the "up" key in the Console to scroll through previous commands

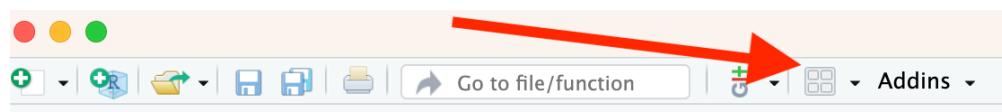
## Lower Right Pane

- **Files** - shows the files on your computer of the directory you are working in
- **Viewer** - can view data or R objects
- **Help** - shows help of R commands
- **Plots** - pictures and figures
- **Packages** - list of R packages that are loaded in memory

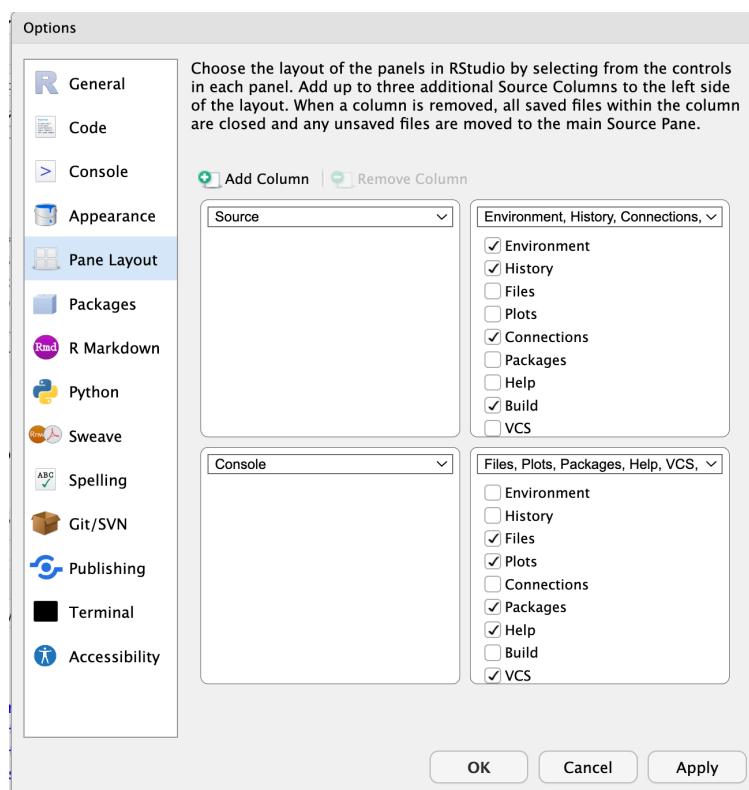
## RStudio Layout

If RStudio doesn't look the way you want (or like our RStudio), then:

Click on the pane button, which looks like a waffle with 4 indentations. Scroll down to "Pane Layout".



## Default Layout



# Let's take a look at R Studio ourselves!

## R Markdown file

R Markdown files (.Rmd) help generate reports that include your code and output.

1. Helps you describe your code
2. Allows you to check the output
3. Can create many different file types

## Code chunks

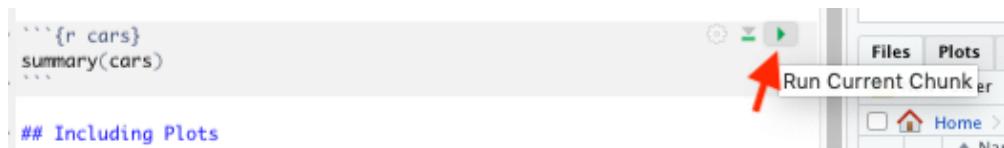
Within R Markdown files are code “chunks”.

This is where you can type R code and run it!



## Run code in a chunk

Clicking the run (play) button runs the code in the chunk.



Ctrl + Enter on Windows or Command + Enter on Mac in your script evaluates that line of code

## Running a chunk executes the code

- generally see a preview of the output of the code just below the chunk
- see the code in the console

The screenshot shows the RStudio interface. At the top, there are two tabs: "Untitled2" and "RStudio.Rmd". Below the tabs is a toolbar with icons for file operations like Open, Save, and Print, along with "Knit on Save" and "Knit" buttons. The main area is divided into two panes: "Source" (left) and "Preview" (right). The Source pane contains R code and text, including a code chunk for the "cars" dataset. The Preview pane displays the resulting HTML output, showing the summary statistics for the "speed" and "dist" variables. Below the Source and Preview panes is a "Console" tab which shows the R session history, including the command `summary(cars)` and its output.

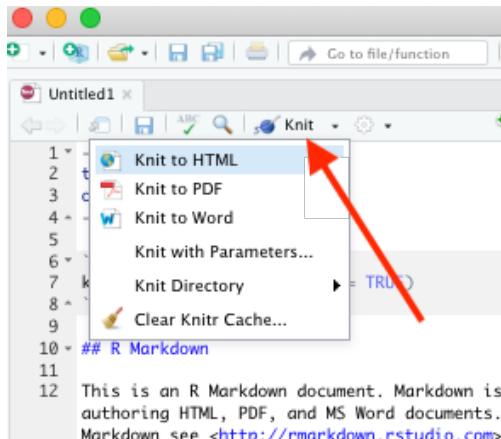
## If you get annoyed by code previews in Markdown files...

See the Help page of the website. You can adjust this and change your RStudio settings:

Tools > Global Options > Appearance

## Knit file to html

Running all chunks - this will create a report from the R Markdown document! Note that it can't use anything not included in the file, it can't use objects in your environment that you were modifying interactively.



## Nice report!

This generates a nice report that you can share with others who can open in any browser.

The screenshot shows a web browser window displaying an R Markdown document titled "Untitled". The document includes author information ("Your Name" and date "2023-03-29"), a section titled "R Markdown", and a note about R Markdown syntax. Below this is an R code chunk with the command `summary(cars)` and its resulting output:

```
summary(cars)

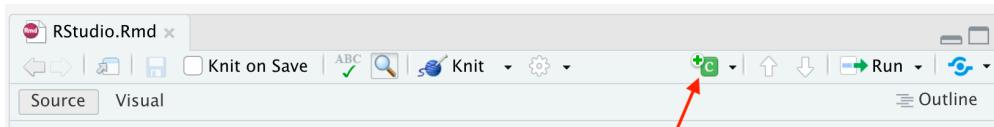
##      speed         dist
##  Min.   :4.0   Min.   : 2.00
##  1st Qu.:12.0  1st Qu.:26.00
##  Median :15.0  Median :36.00
##  Mean   :15.4  Mean   :42.98
##  3rd Qu.:19.0  3rd Qu.:56.00
##  Max.   :25.0  Max.   :120.00
```

Following this is a section titled "Including Plots" with a note about embedding plots.

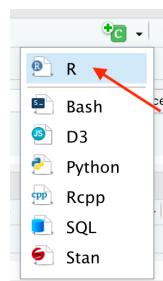
## Create Chunks

To create a new R code chunk:

- Use the insert code chunk button at the top of RStudio.



- Select R (default) as the language:



## Create Chunks

If you like keyboard shortcuts:

- Windows & Linux use Ctrl+Alt+I
- Mac use Command+Option+I

I is for insert.

## Run previous chunks button

You can run all chunks above a specific chunk using this button:



## Errors

R studio can help you find issues in your code. Note that sometimes the error occurs earlier than RStudio thinks.



## Recap of where code goes

- you can test code in the console

A screenshot of the RStudio console tab. The console output shows:

```
Console Terminal × Render × Background Jobs ×
R 4.2.2 · ~/Documents/GitHub/Teaching/intro_to_r/ ↗
>
> class(iris)
```

- you can save code in a chunk in the editor (Markdown file)

A screenshot of the RStudio code editor showing code within a grey chunk. A red box highlights the code:

```
## R Markdown

Code does not go here and instead goes within the grey chunks like this:

```{r}
summary(cars)
````
```

## Gut Check

Why are R Markdown files so useful?

- A) They let you test your code
- B) They let you view the output of your code
- C) They let you generate cool reports
- D) All of the above

## Gut Check

Where does code go typically in an Rmd file?

A

```
```{r}
```

B

```
...
```

C

## Gut Check

Which button do you click to run the code in a current chunk?

```
```{r}
library(tidyverse)
```
```



A B

## Getting help from the preview

When you type in a function name, a pop up will preview documentation to help you. It also helps you remember the name of the function if you don't remember all of it!

The screenshot shows two tooltip windows for R functions. The top tooltip is for the 'class' function, which is part of the base package. It shows the function signature 'class(x)' and a brief description: 'R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.' The bottom tooltip is for the 'read\_csv' function, which is part of the 'tidyverse' package. It shows the function signature 'read\_csv(file, col\_names = TRUE, col\_types = NULL, ...)' and a detailed description of its parameters.

Get help with the help pane

The screenshot shows the R help pane interface. At the top, there is a menu bar with tabs: Files, Plots, Packages, Help, Git, Viewer, and Presentation. Below the menu bar is a toolbar with icons for back, forward, search, and other functions. A search bar contains the text "class". The main content area has a title "R: Object Classes" with a dropdown arrow, and a "Find in Topic" button. Below the title, the text "class {base}" is displayed, followed by "R Documentation". The main content area contains the following sections:

## Object Classes

### Description

R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.

### Usage

```
class(x)
class(x) <- value
unclass(x)
inherits(x, what, which = FALSE)
isa(x, what)

oldClass(x)
oldClass(x) <- value
class2(x)
```

### Getting Help with ?

If you know the name of a package or function:

Type `?package_name` or `?function_name` in the console to get information about packages and functions.

For example: `?readr` or `?read_csv`.

The screenshot shows the RStudio interface. On the left is the R console window, which contains the following R code:

```
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>
> ?class
>
```

On the right is the help documentation for the 'class' function, titled 'Object Classes'. The 'Description' section states: "R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function." The 'Usage' section includes the following R code:

```
class(x)
class(x) <- value
unclass(x)
inherits(x, what, which = FALSE)
isa(x, what)
```

## Double Question Mark

If you haven't loaded a package yet into R than you may get a response that there is no documentation.

Typing in `??package_name` can show you packages that you haven't loaded yet.

The screenshot shows the RStudio interface. On the left is the R console window, which contains the following R code:

```
>
>
>
>
>
>
>
>
>
>
> ?class
> ?tidyverse
No documentation for 'tidyverse' in specified packages and libraries:
you could try '??tidyverse'
> ??tidyverse
> library(tidyverse)
-- Attaching packages -- tidyverse 1.3.2 --
✓ ggplot2 3.4.0   ✓ dplyr  1.0.10
✓ tibble  3.1.8   ✓ stringr 1.5.0
✓ tidyr   1.2.0   ✓ forcats 0.5.1
✓ purrr  1.0.0
-- Conflicts -- tidyverse_conflicts() --
✖ dplyr::filter() masks stats::filter()
✖ dplyr::lag()   masks stats::lag()
> ?tidyverse
> |
```

On the right is the help documentation for the 'tidyverse' package, titled 'tidyverse: Easily Install and Load the 'Tidyverse''. The 'Description' section states: "The 'tidyverse' is a set of packages that work in harmony because they share common data representations and 'API' design. This package is designed to make it easy to install and load multiple 'tidyverse' packages in a single step. Learn more about the 'tidyverse' at <https://www.tidyverse.org>." The 'Author(s)' section lists Hadley Wickham as the maintainer ([hadley@rstudio.com](mailto:hadley@rstudio.com)). To the right of the documentation is the 'tidyverse' logo, which is a dark hexagon filled with colorful dots.

## Summary

- RStudio makes working in R easier
- the Editor (top) is for static code like scripts or R Markdown documents
- The console is for testing code (bottom) - best to save your code though!
- R markdown documents are really helpful for lots of reasons!
- R code goes within what is called a chunk (the gray box with a green play button)

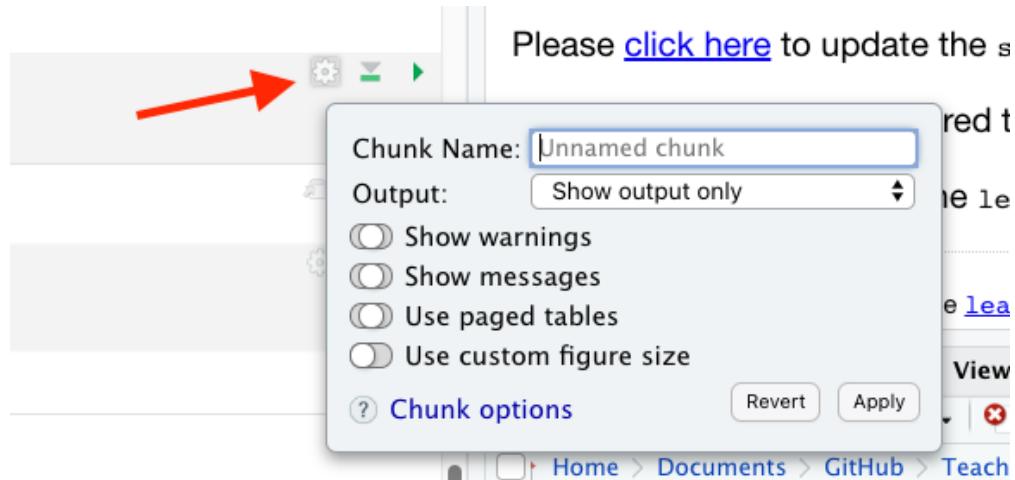
[Class Website](#) [Lab](#) [Posit Cheatsheet](#) [Day 1 Cheatsheet](#)



Image by Gerd Altmann from Pixabay

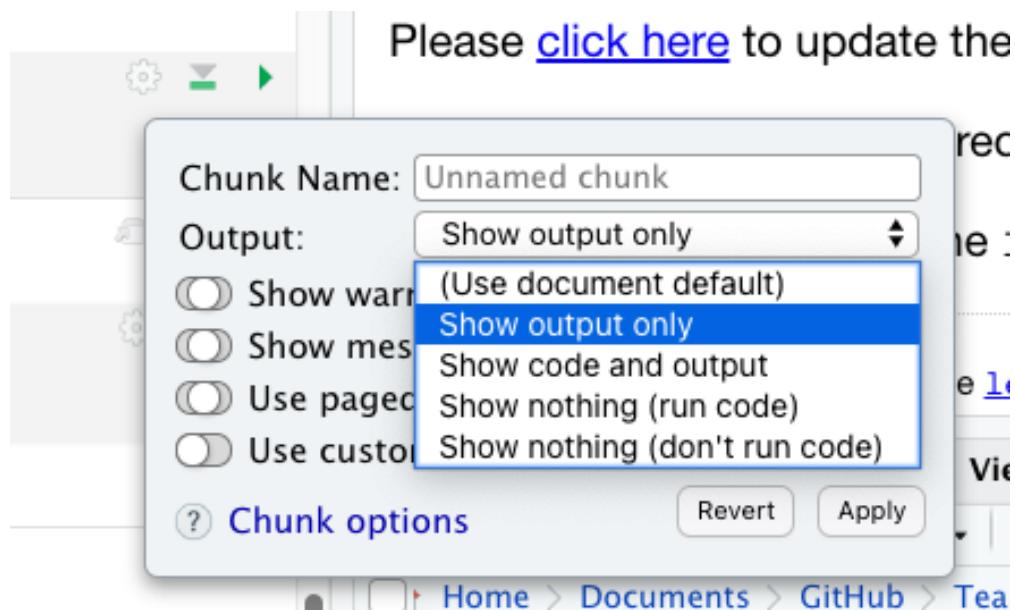
## Extra Slides

### Chunk settings



### Chunk settings

You can specify if a chunk will be seen in the report or not.



## Rainbow Parentheses

Tools -> Global Options -> Code -> Display -> Use rainbow parentheses

This can help you see your code more easily.

Press enter to save this setting and get out of this menu.

████████████████████████████████ Enjoy your colorful code! █████████████████████████████████