

Getting started with R and RStudio





The engine



The dashboard

A tour of RStudio

~/Dropbox/Teaching/Workshops/2020-gpl/01_welcome-tidyverse - RStudio

Go to file/function Addins

01_welcome-tidyverse

Console Terminal x Jobs x

~/Dropbox/Teaching/Workshops/2020-gpl/01_welcome-tidyverse/

```
R version 4.0.0 (2020-04-24) -- "Arbor Day"
Copyright (C) 2020 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin17.0 (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.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> |
```

Environment History Connections Tutorial

Import Dataset List

Global Environment

Environment is empty

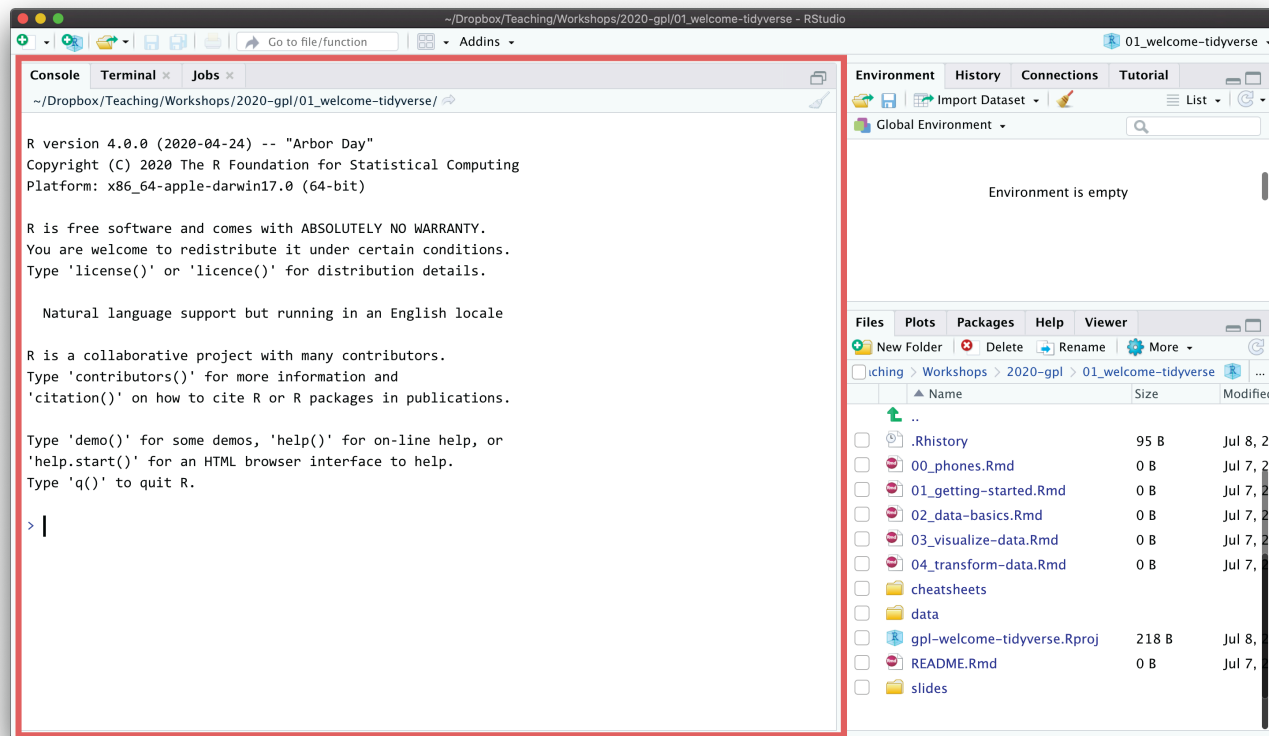
Files Plots Packages Help Viewer

New Folder Delete Rename More

iching > Workshops > 2020-gpl > 01_welcome-tidyverse

	Name	Size	Modified
↑	..		
<input type="checkbox"/>	.Rhistory	95 B	Jul 8, 2
<input type="checkbox"/>	00_phones.Rmd	0 B	Jul 7, 2
<input type="checkbox"/>	01_getting-started.Rmd	0 B	Jul 7, 2
<input type="checkbox"/>	02_data-basics.Rmd	0 B	Jul 7, 2
<input type="checkbox"/>	03_visualize-data.Rmd	0 B	Jul 7, 2
<input type="checkbox"/>	04_transform-data.Rmd	0 B	Jul 7, 2
<input type="checkbox"/>	cheatsheets		
<input type="checkbox"/>	data		
<input type="checkbox"/>	gpl-welcome-tidyverse.Rproj	218 B	Jul 8, 2
<input type="checkbox"/>	README.Rmd	0 B	Jul 7, 2
<input type="checkbox"/>	slides		

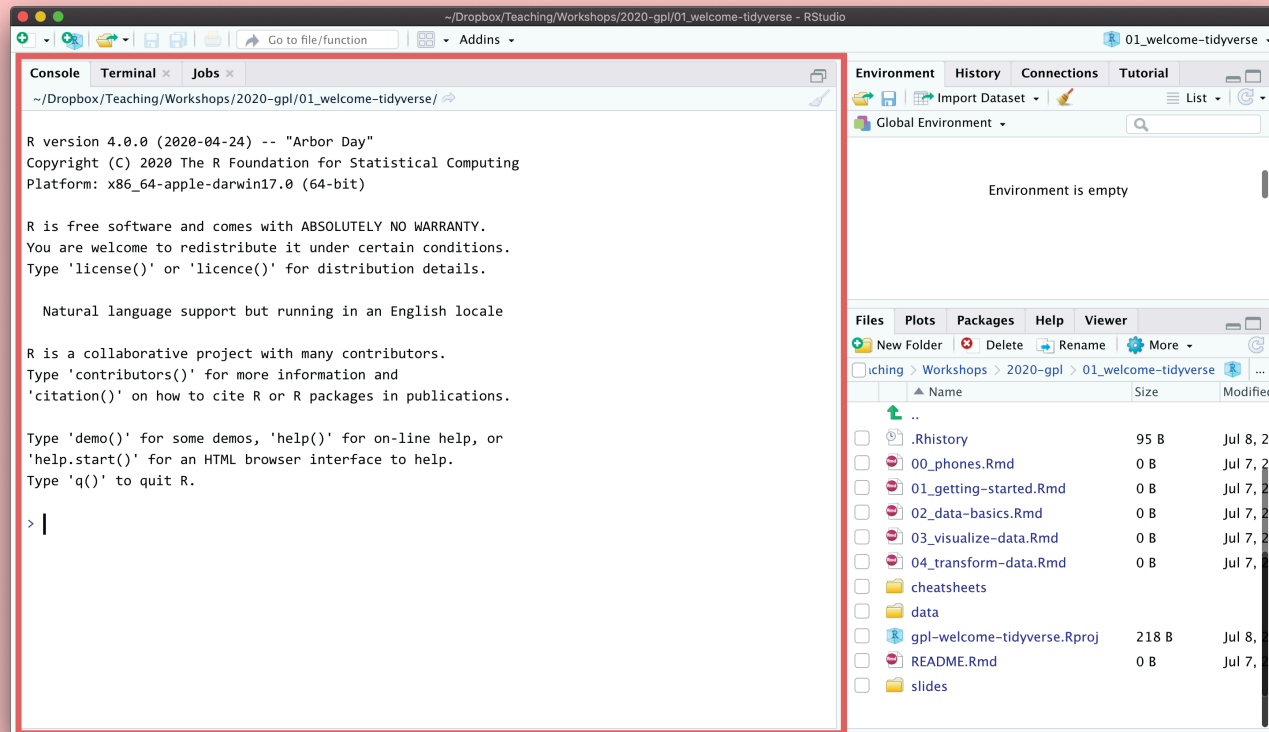
Console



R is awaiting your instructions

Type code here, press enter, and R will run it

Your turn



Type `2 + 2` in the console

Press enter

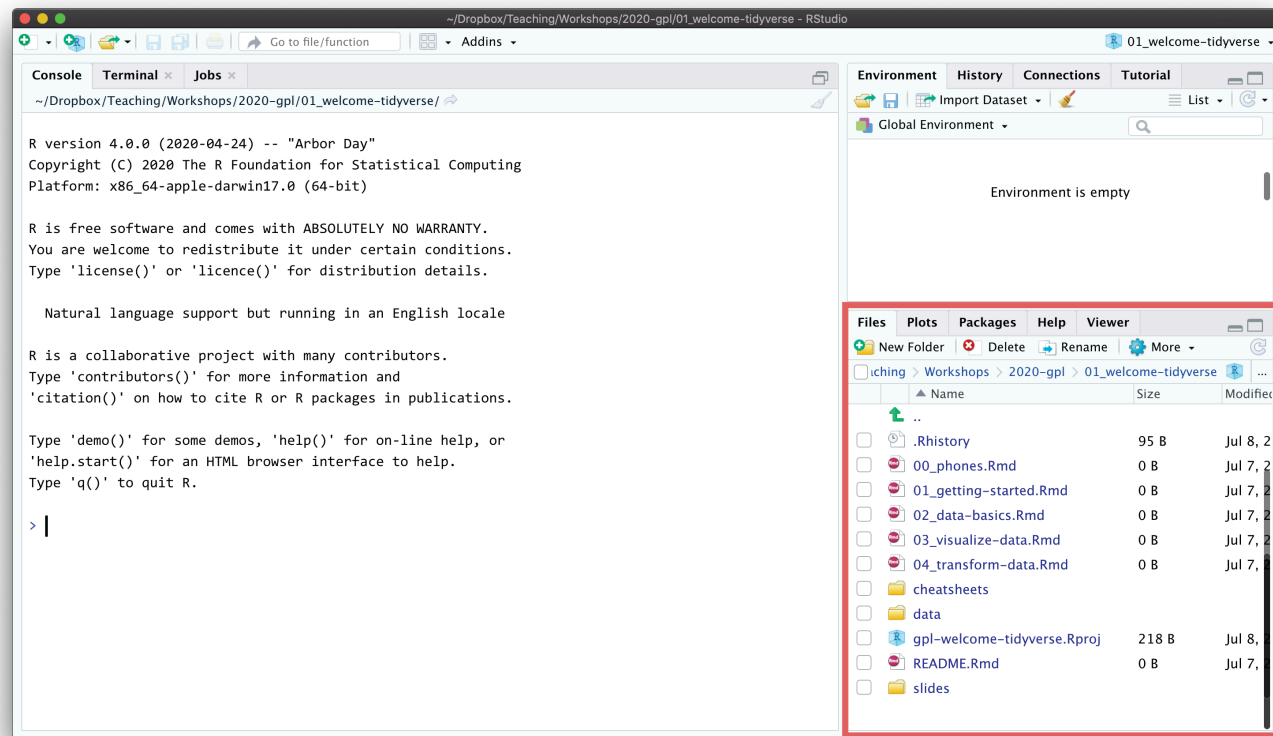
```
2 + 2
```

```
## [1] 4
```

**This is ephemeral though.
If you want to run this again, you'll have to type it again.**

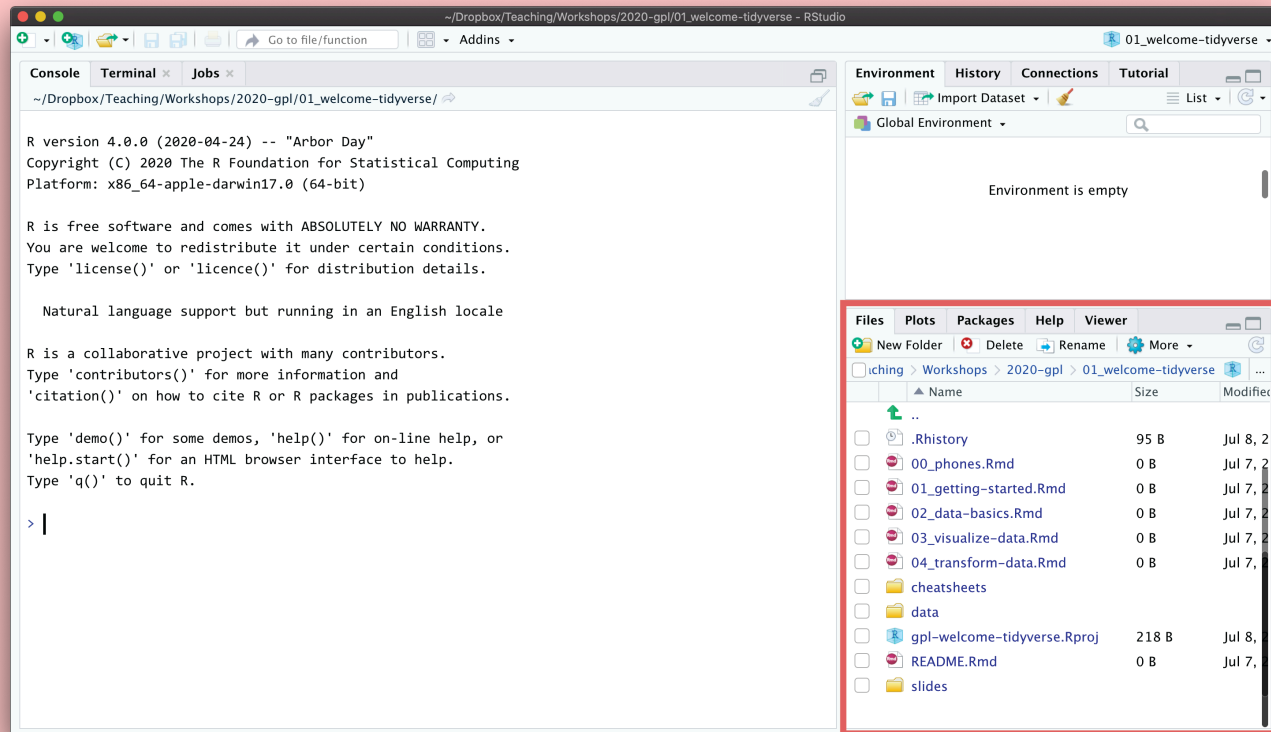
Store R code in a document instead

Files pane



All the files in your
current working
directory

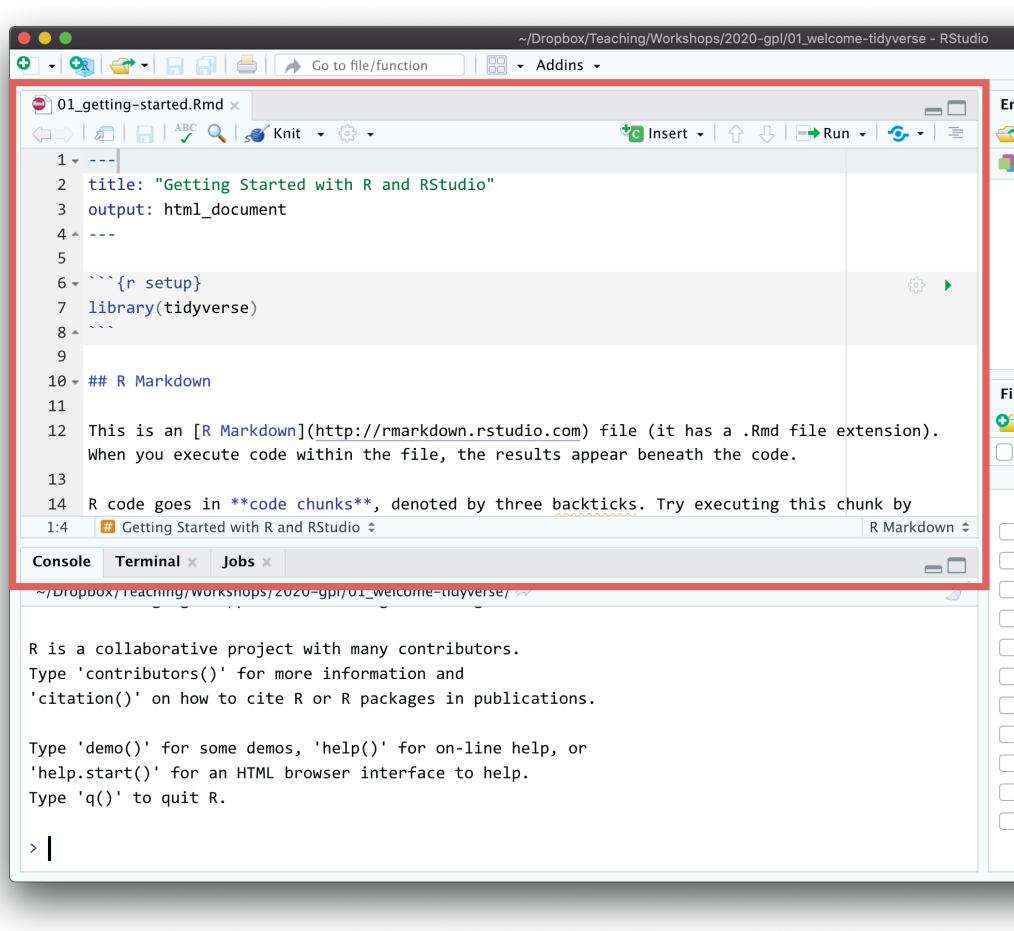
Your turn



Find 01_getting-started.qmd

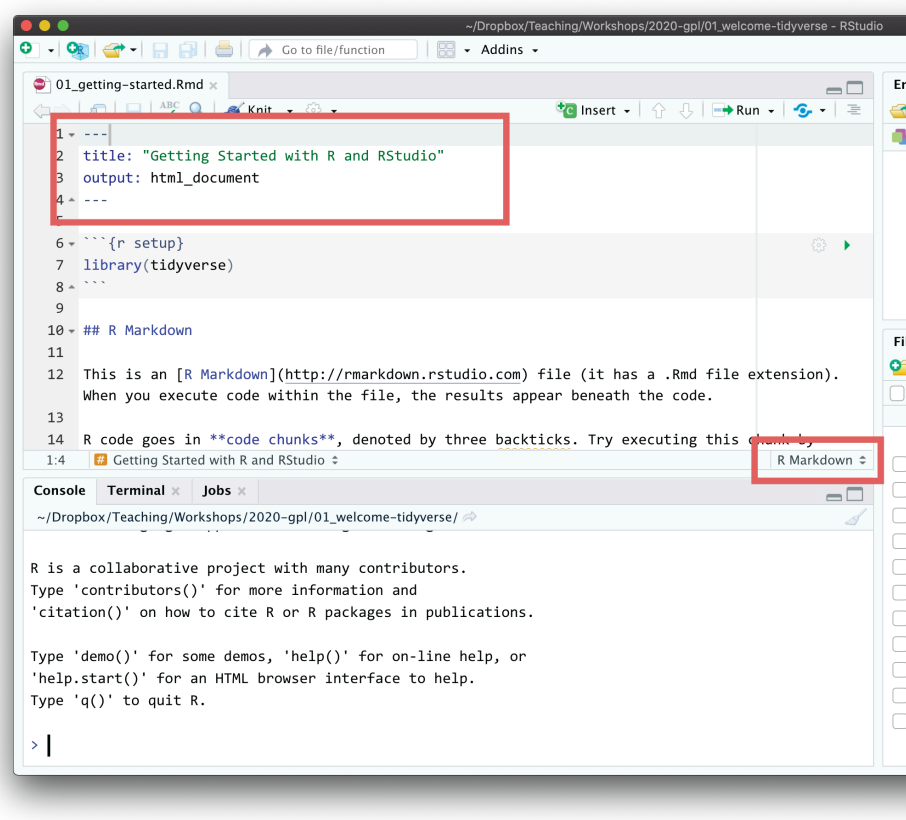
Click on its name to open the file

Source pane



Documents
open here

Quarto



Document format that
combines text and code

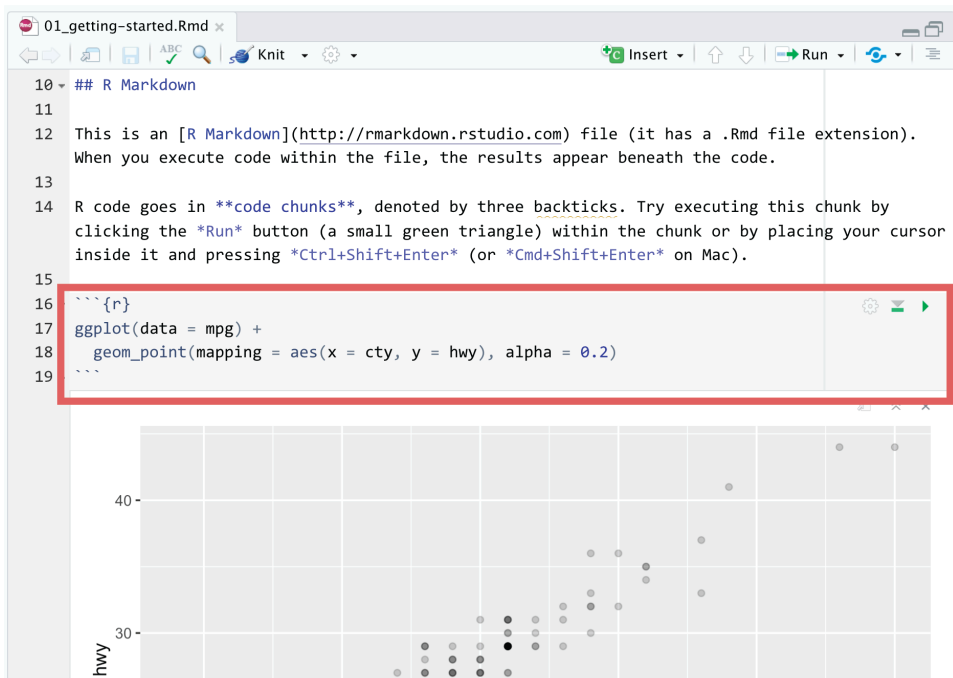
Acts like a notebook
for your analysis

Quarto



Text

Quarto



Text

Code

Quarto



Text

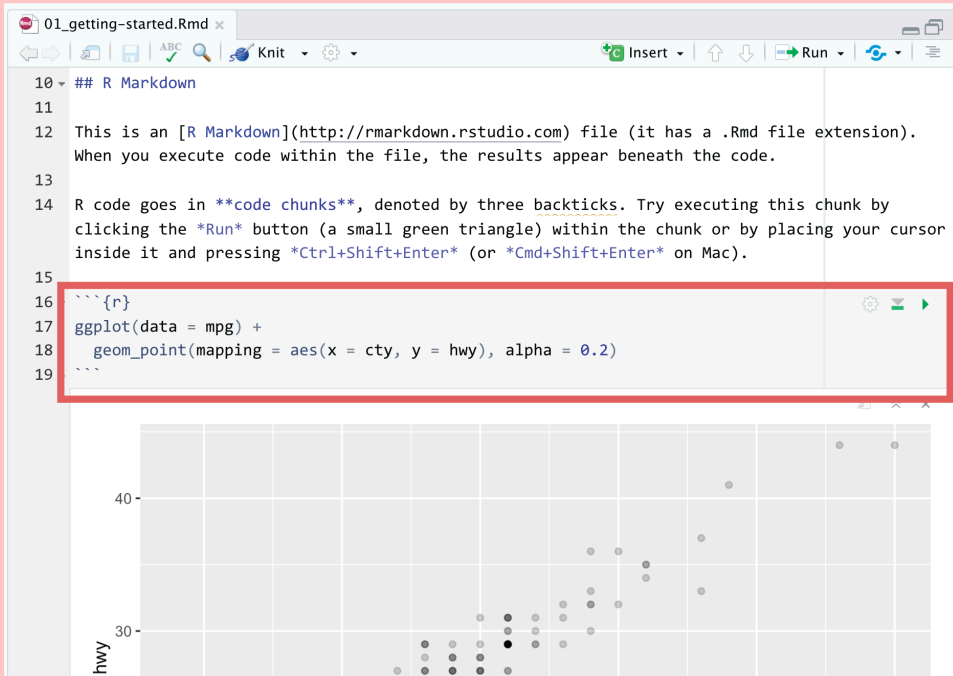
Code

Output

Your turn

Read the instructions

Run the code chunk by clicking the play button



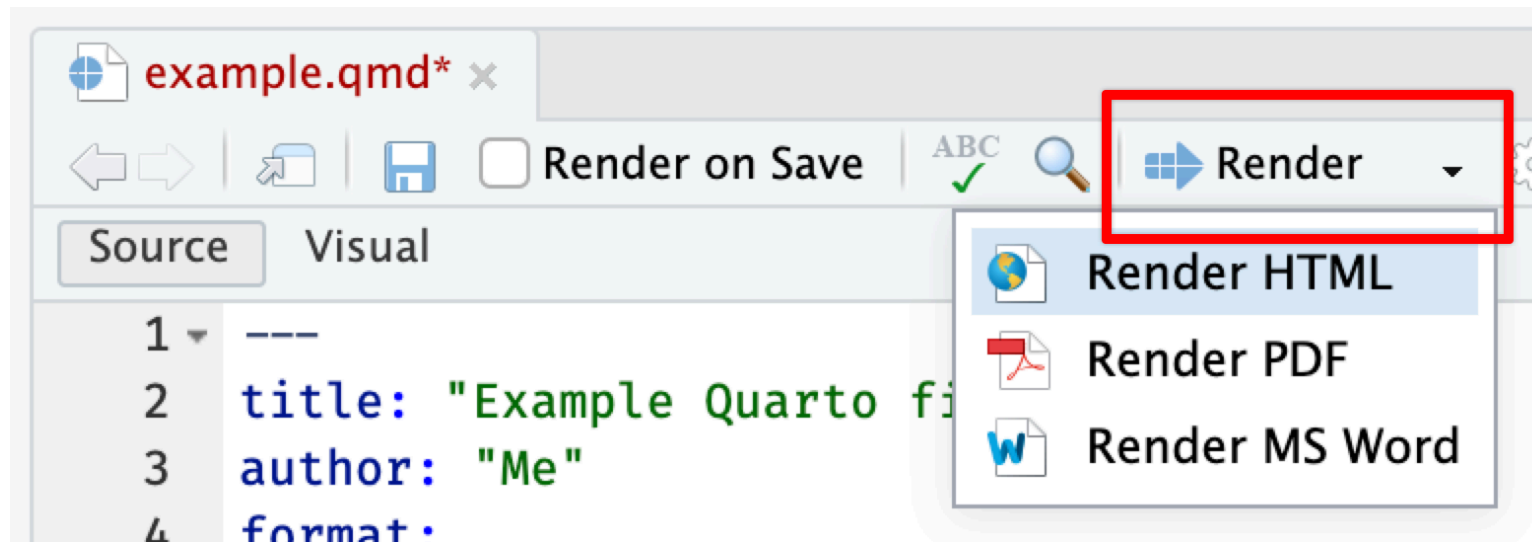
Your turn

Add a new chunk

Put $2 + 2$ in the chunk and run it

Render

Render a Quarto document into a standalone shareable file



Quarto

The best way to combine R code and narrative

We'll use it throughout the class:

I'll provide starter code

You'll complete "Your turns"

In the end, you'll have an annotated record for yourself

Your turn

Spot the difference:

```
filter(mtcars, cyl == 4)
```

```
four_cyls <- filter(mtcars, cyl == 4)
```

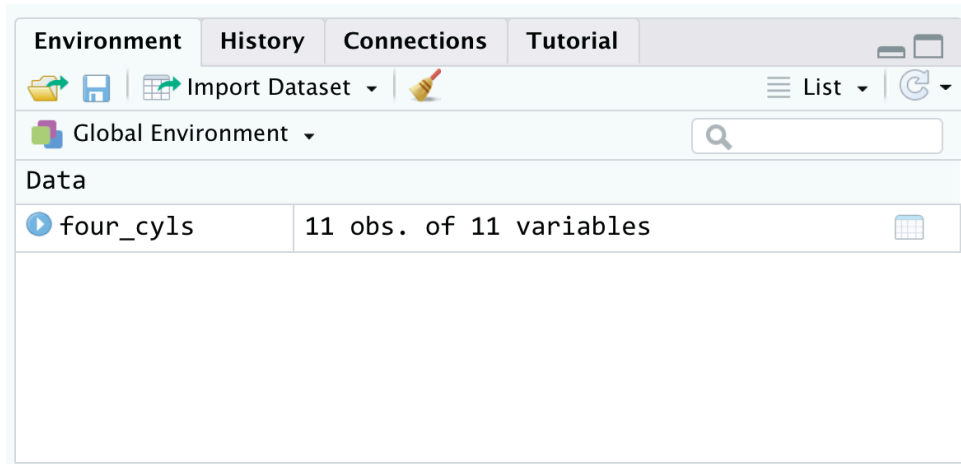
**Find these chunks in the notebook and run them.
What's different about what happens?**

Assignment

<- assigns the output from the righthand side to a variable with the name on the lefthand side

```
four_cyls <- filter(mtcars, cyl == 4)
```

Environment pane



**List of all the
variables you've created**

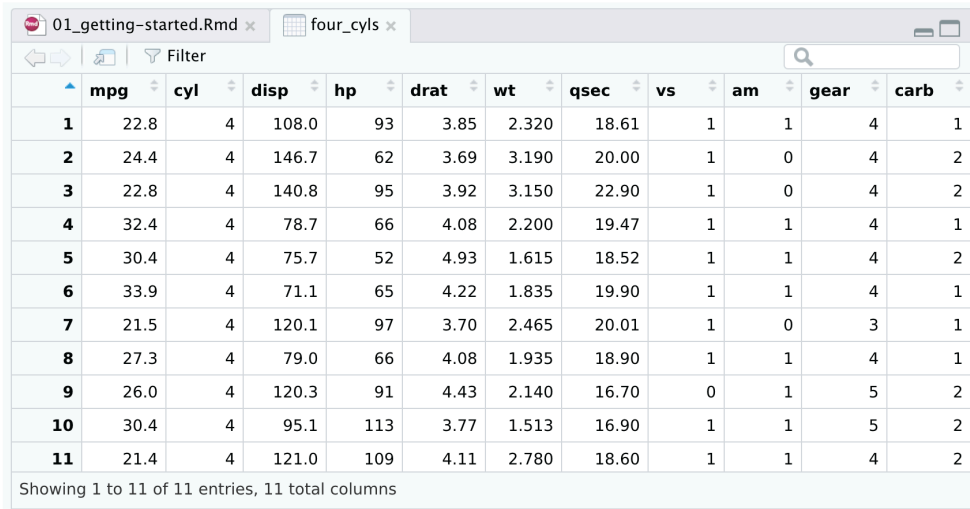
Your turn

Find `four_cyls` in the environment pane.
Click on the name `four_cyls`

What happens?

Viewer

Clicking on an object in the environment panel opens it an interactive viewer tab



The screenshot shows the RStudio Viewer interface. At the top, there are two tabs: '01_getting-started.Rmd' and 'four_cyls'. The 'four_cyls' tab is active, displaying a data table with 11 rows and 12 columns. The columns are labeled: mpg, cyl, disp, hp, drat, wt, qsec, vs, am, gear, carb. The rows are numbered 1 through 11. Below the table, a status bar indicates 'Showing 1 to 11 of 11 entries, 11 total columns'.

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
1	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
2	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
3	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
4	32.4	4	78.7	66	4.08	2.200	19.47	1	1	4	1
5	30.4	4	75.7	52	4.93	1.615	18.52	1	1	4	2
6	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1
7	21.5	4	120.1	97	3.70	2.465	20.01	1	0	3	1
8	27.3	4	79.0	66	4.08	1.935	18.90	1	1	4	1
9	26.0	4	120.3	91	4.43	2.140	16.70	0	1	5	2
10	30.4	4	95.1	113	3.77	1.513	16.90	1	1	5	2
11	21.4	4	121.0	109	4.11	2.780	18.60	1	1	4	2

Showing 1 to 11 of 11 entries, 11 total columns

Functions

Functions do things

Functions take arguments, output results

If you want to keep the output, assign it to a variable

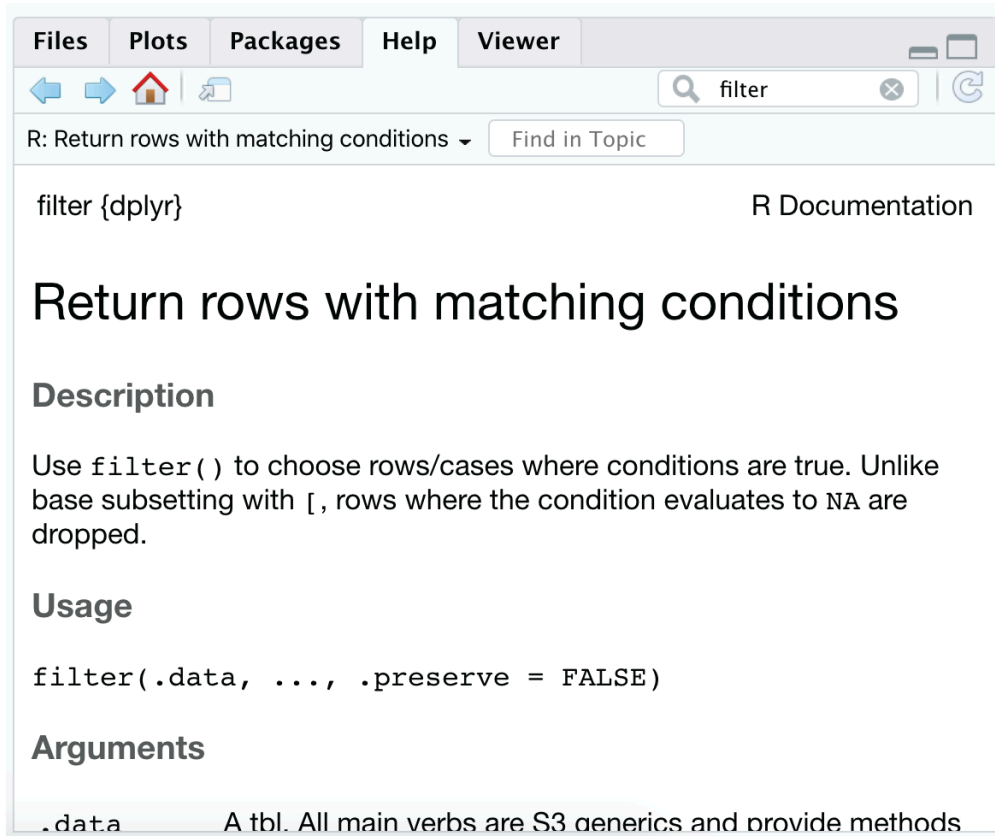
Help

To look up the help page for an R function,
type this in the console:

```
?function_name
```

(Or google it!)

Help pane



These help pages provide details about the arguments you can supply a function

Often full of examples at the bottom

Your turn

Look at the help page for `seq`

Add a chunk that uses `seq()` to create a list of numbers from 5 to 100, spaced by 5 (so 5, 10, 15, 20, ...)

02:00

```
seq(from = 5, to = 100, by = 5)
```

```
## [1] 5 10 15 20 25 30 35 40 45 50 55 60 65 70  
## [20] 100
```

Common syntax problem #1

Missing closing parentheses or quotes

```
mean(mtcars
```

```
"Oops this is wrong
```

Common syntax problem #2

Surrounding something in quotes when it should be (or vice versa)

```
mean("mtcars")
```

```
## Warning in mean.default("mtcars"): argument is not numeric or  
## returning NA
```

```
## [1] NA
```

Your turn

There are three chunks under "Syntax gone wrong"

Run each, read the error message, and try to fix the syntax

Cheatsheets

Go to Help > Cheatsheets to find quick reference guides to different packages

RStudio IDE : : CHEAT SHEET

Documents and Apps

Open Shiny, R Markdown, knitr, Sweave, LaTeX, RUI files and more in Source Pane

Check spelling, Render output, Choose output format, Choose output location, Insert code chunk

Jump to previous chunk, Jump to next chunk, Run this chunk, Publish to server, Show file outline, Run this chunk, Run all previous code chunks, Run this chunk, Run all previous code chunks, Run this chunk, Run all previous code chunks

Access markdown guide at **Help > Markdown Quick Reference**

Jump to chunk, Set knitr chunk options, Run this chunk, Run all previous code chunks, Run this chunk, Run all previous code chunks

RStudio recognizes that files named **app.R**, **server.R**, **ui.R**, and **global.R** belong to a shiny app

Run app, Choose location to publish, Publish to shinyapps.io, Manage view app or server, Publish to shinyapps.io, Manage view app or server

Write Code

Navigate tabs, Open in new window, Save, Find and replace, Compile and notebook, Run selected code

1 Good Start...
2 Custom of RStudio
3 shared users
4 Multiple cursors/selection
5 Code diagnostics that appear in the margin
6 Hover over diagnostic symbols for details
7 Syntax highlighting based on your file's extension
8 Tab completion to finish function names, file paths, arguments, and more
9 Multi-language code snippets to quickly use common blocks of code
10 Change file type

Working Directory, Maximize, minimize panes, Press **Ctrl** to see command history, Drag pane boundaries

R Support

Import data with wizard, History of past commands to run/redo, Display R/Reps slideshows, **File > New File > R Presentation**

Load workspace, Save workspace, Delete all saved objects, Choose environment to display from list of parent environments, Display objects as list or grid

Defunct, 128 bits of 5 variables, Values, Functions, File

Displays saved objects by type with short description, View in data viewer, View function source code

Create folder, Upload file, Delete file, Rename file, Change directory

Path to displayed directory, A file browser keyed to your working directory, Click on file or directory name to open

Pro Features

Share Project with Collaborators, Active shared collaborators, Start new R Session in current project, Close R Session in project, Select R Version

PROJECT SYSTEM
File > New Project

RStudio saves the call history, workspace, and working directory associated with a project. It reloads each when you reopen a project.

Name of current project

RStudio opens plots in a dedicated Plots pane

Navigate recent plots, Open in plot window, Export plot, Delete plot, Delete all plots

GUI Package manager lists every installed package

Install Packages, Update Packages, Create reproducible package, Packages library for your project

Click to load package with **library()** or click to detach package with **detach()**

Package version, Delete from library, Delete installed library

RStudio opens documentation in a dedicated Help pane

Home page of helpful links, Search within help file, Search for help file

Viewer Pane displays HTML content, such as Shiny apps, R Markdown reports, and interactive visualizations

View **<data>** opens spreadsheet like view of data set

Stop Shiny app, Publish to shinyapps.io, Refresh, Filter rows by value or value range, Sort by values, Search for value

Debug Mode

Open with **debug()**, **browser()**, or a breakpoint. RStudio will open the debugger mode when it encounters a breakpoint while executing code.

Launch debugger mode from origin of error, Open traceback to examine the functions that R called before the error occurred

Click next to line number to add/remove a breakpoint

Highlighted line shows where execution has paused

Run commands in environment where execution has paused, Examine variables in traceback to debug, Select function in traceback to debug

Step through, Step into and out of functions, Resume execution mode, Quit debug

Console: **Next**, **Continue**, **Stop**

Version Control

Turn on in **Tools > Project Options > Git/SVN**

Stage files, Show file diff, Commit staged files to remote, Push/Pull View History

Added, Deleted, Modified, Renamed, Untracked

Open shell to execute system commands, Current branch

Package Writing

File > New Project > New Directory > R Package

Turn project into package, Enable roxygen documentation with **Tools > Project Options > Build Tools**

Roxygen guide at **Help > Roxygen Quick Reference**



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Next up

Data basics