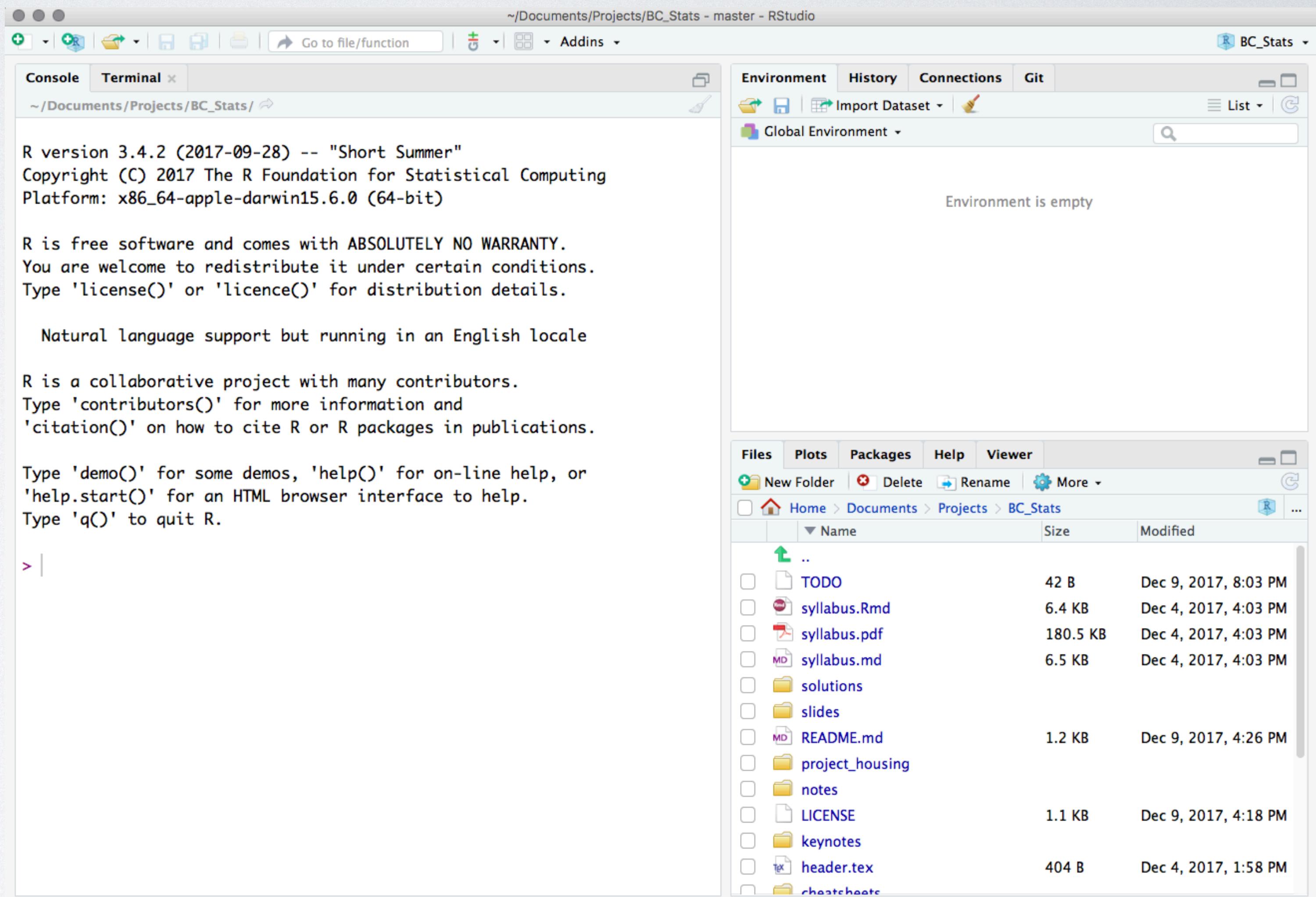


# Getting Started with R and RStudio

# Your Turn

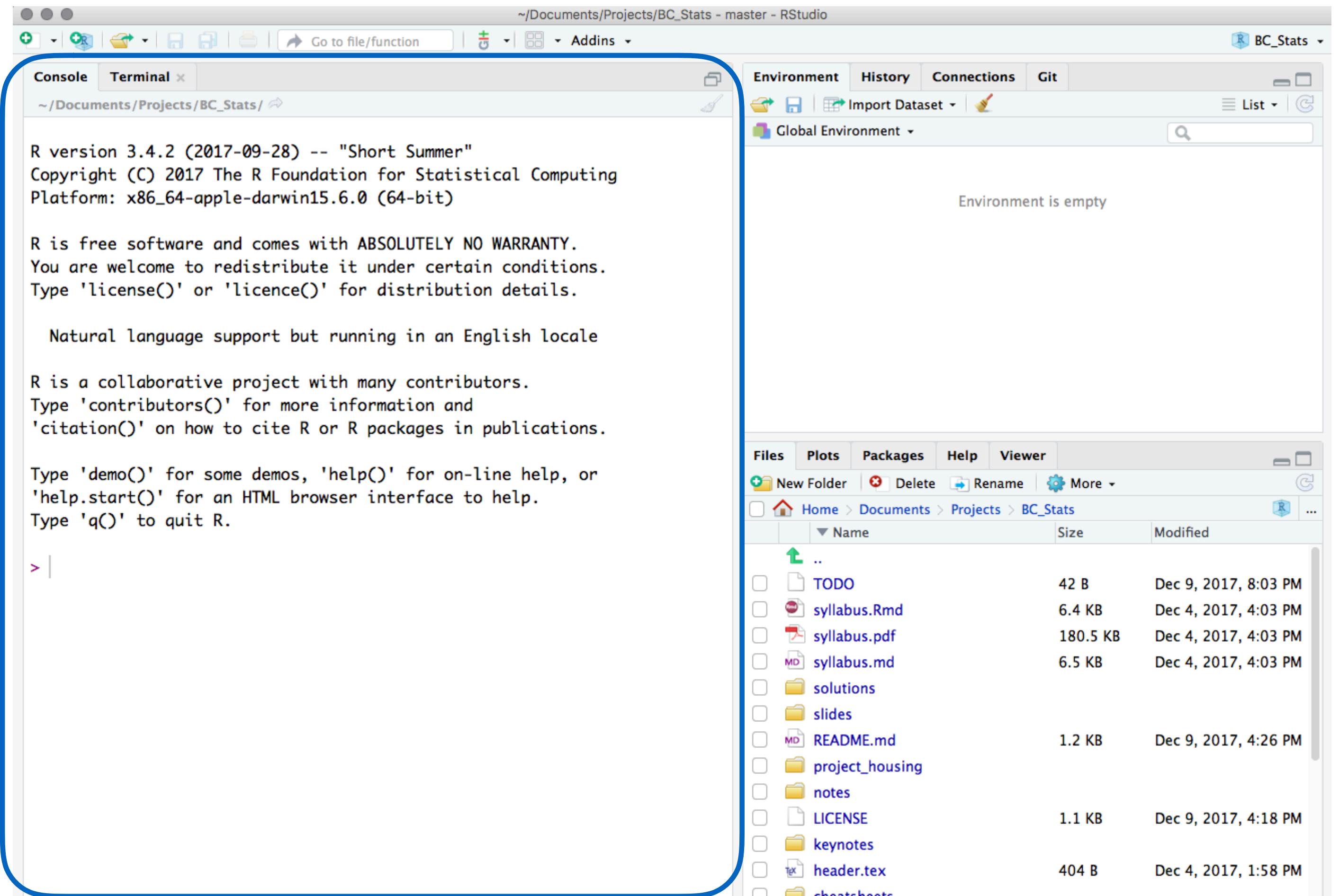
Go back to your web browser and make sure you can still see the workshop “project.”



# Console

R is awaiting your instructions

You can type code here,  
hit Enter, and R will  
evaluate it,  
a.k.a "running code"



# Your Turn

Into the console,  
type:

2 + 2

Then hit Enter

The screenshot shows the RStudio interface with the following details:

- Console Tab:** The main pane displays the R startup message and a prompt:

```
R version 3.4.2 (2017-09-28) -- "Short Summer"
Copyright (C) 2017 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin15.6.0 (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 Tab:** Shows the Global Environment pane with the message "Environment is empty".
- Files Tab:** Shows the file structure of the BC\_Stats project:

Name	Size	Modified
..		
TODO	42 B	Dec 9, 2017, 8:03 PM
syllabus.Rmd	6.4 KB	Dec 4, 2017, 4:03 PM
syllabus.pdf	180.5 KB	Dec 4, 2017, 4:03 PM
syllabus.md	6.5 KB	Dec 4, 2017, 4:03 PM
solutions		
slides		
README.md	1.2 KB	Dec 9, 2017, 4:26 PM
project_housing		
notes		
LICENSE	1.1 KB	Dec 9, 2017, 4:18 PM
keynotes		
header.tex	404 B	Dec 4, 2017, 1:58 PM
cheatsheets		

Console Terminal ×

~/Documents/Projects/BC\_Stats/ ↵

```
R version 3.4.2 (2017-09-28) -- "Short Summer"
Copyright (C) 2017 The R Foundation for Statistical Computing
Platform: x86_64-apple-darwin15.6.0 (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

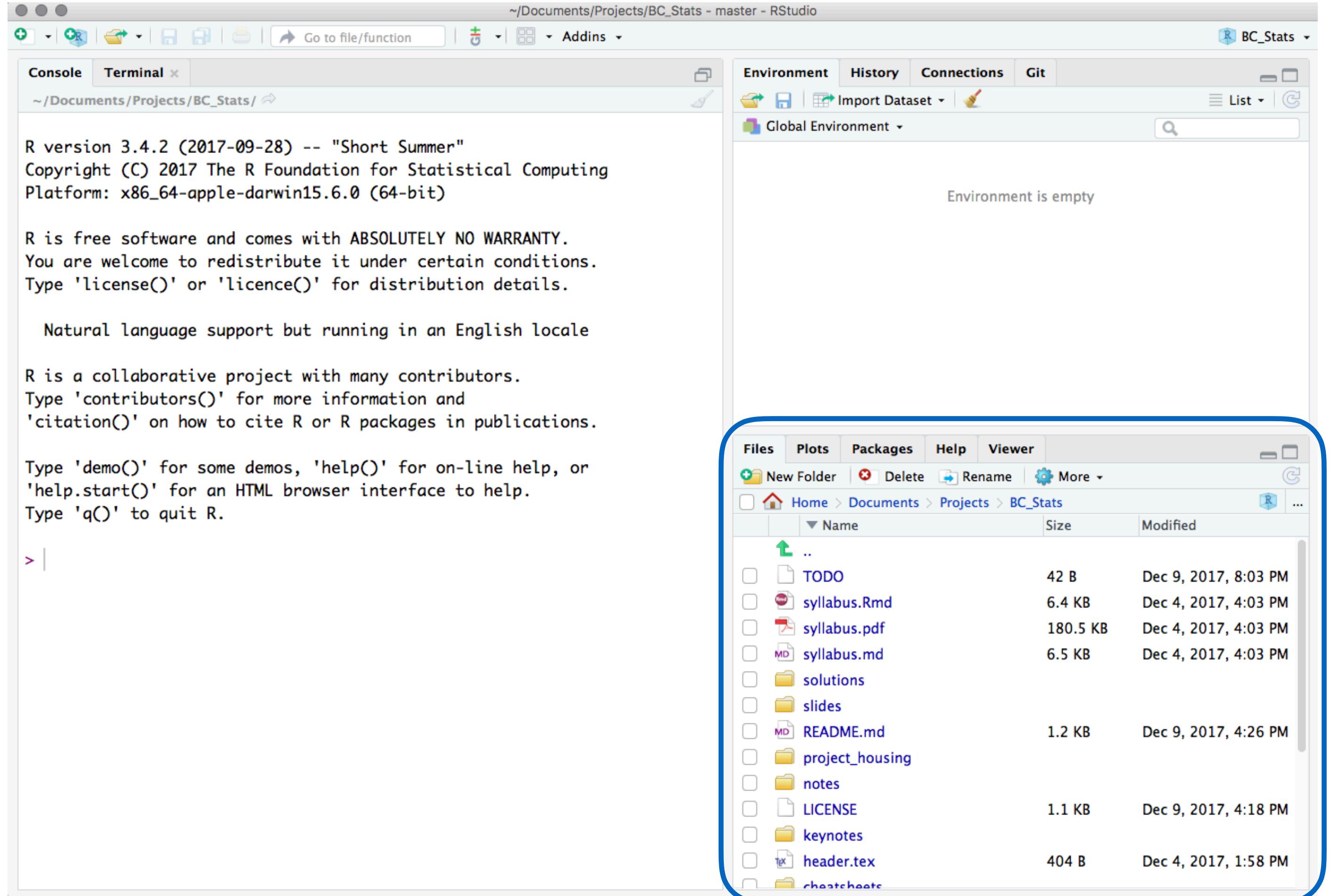
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

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.

> 2 + 2
[1] 4
>
```

```
> 2 + 2
[1] 4
```

You asked, and R answered,  
but this is ephemeral.  
In practice you'll keep your R code in a  
document.

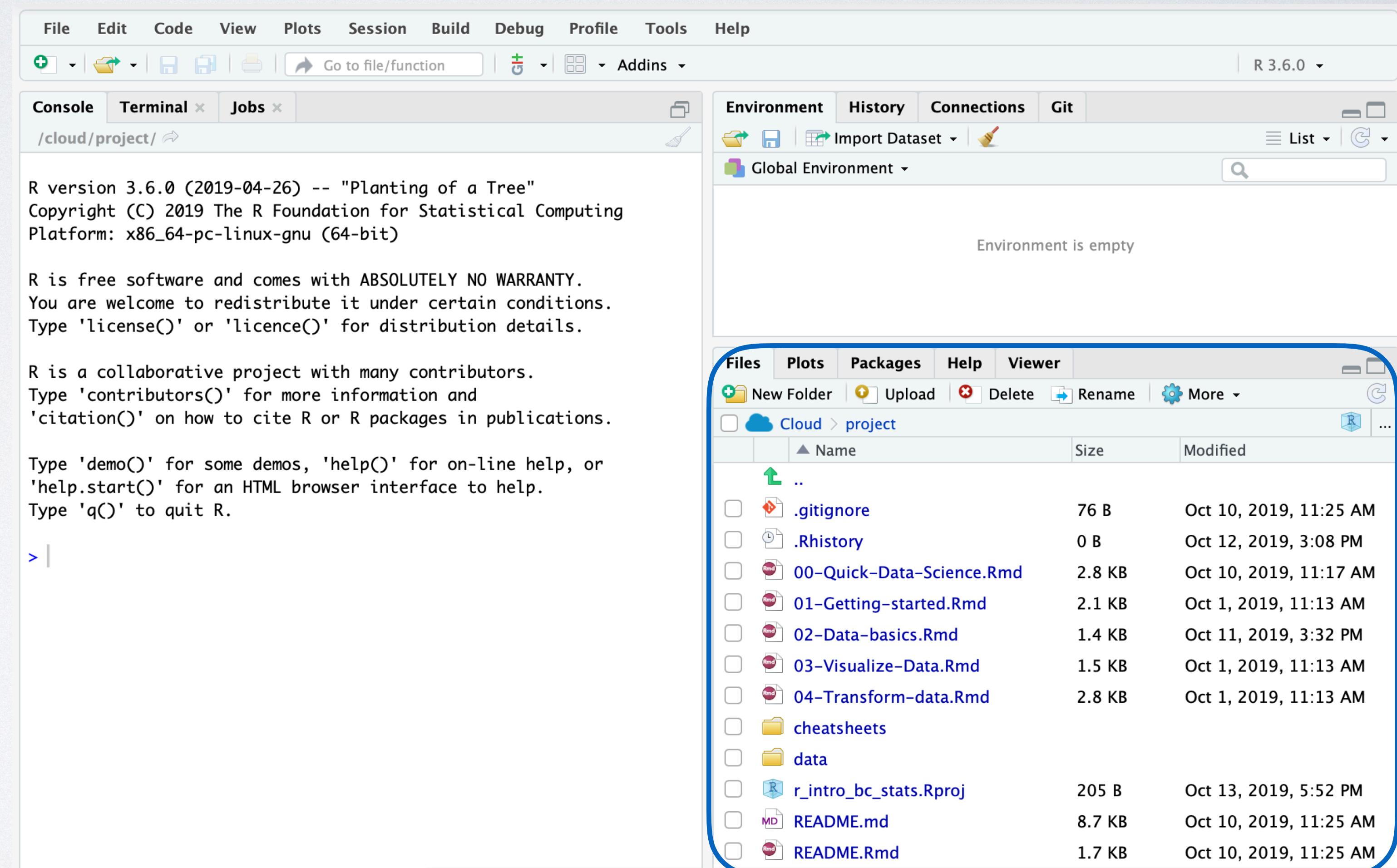


# Files Pane

## Files in your current working directory.

# Your Turn

In the Files Pane,  
Find 01-Getting-started.Rmd  
  
Click on its name to open the file.



The screenshot shows the RStudio interface with the following details:

- Console Tab:** Displays the R startup message:

```
R version 3.6.0 (2019-04-26) -- "Planting of a Tree"
Copyright (C) 2019 The R Foundation for Statistical Computing
Platform: x86_64-pc-linux-gnu (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.

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 Tab:** Shows the Global Environment pane with the message "Environment is empty".
- Files Tab:** Shows the contents of the "Cloud > project" folder:

Name	Size	Modified
.gitignore	76 B	Oct 10, 2019, 11:25 AM
.Rhistory	0 B	Oct 12, 2019, 3:08 PM
00-Quick-Data-Science.Rmd	2.8 KB	Oct 10, 2019, 11:17 AM
01-Getting-started.Rmd	2.1 KB	Oct 1, 2019, 11:13 AM
02-Data-basics.Rmd	1.4 KB	Oct 11, 2019, 3:32 PM
03-Visualize-Data.Rmd	1.5 KB	Oct 1, 2019, 11:13 AM
04-Transform-data.Rmd	2.8 KB	Oct 1, 2019, 11:13 AM
cheatsheets		
data		
r_intro_bc_stats.Rproj	205 B	Oct 13, 2019, 5:52 PM
README.md	8.7 KB	Oct 10, 2019, 11:25 AM
README.Rmd	1.7 KB	Oct 10, 2019, 11:25 AM

The screenshot shows the RStudio interface with the Source pane highlighted by a blue border. The document is titled "01-Getting-started.Rmd" and contains R Markdown code. The code includes YAML front matter, a license notice, and several code chunks. The R Markdown tab is selected in the bottom navigation bar.

```
1 ---  
2 title: "Getting Started with R and RStudio"  
3 output: html_document  
4 ---  
5  
6 <!-- This file by Charlotte Wickham is licensed under a Creative  
7 Commons Attribution 4.0 International License. -->  
8  
9 library(tidyverse)  
10  
11  
12 ## R Markdown  
13  
14 This is an [R Markdown](http://rmarkdown.rstudio.com) file (it  
has a .Rmd file extension). When you execute code within the  
file, the results appear beneath the code.  
15  
16 R code goes in **code chunks**, denoted by three backticks. Try  
executing this chunk by clicking the *Run* button (a small green  
triangle) within the chunk or by placing your cursor inside it  
and pressing *Ctrl+Shift+Enter* (or *Cmd+Shift+Enter* on Mac).  
17  
18 ggplot(data = mpg) +  
19   geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)  
20  
21
```

37:1 C Chunk 4 R Markdown

Console Terminal R Markdown

~/Documents/Projects/BC\_Stats/ ↵

# Source Pane

## Documents open up here.

```
01-Getting-started.Rmd x ABC Knit Insert Run

1 ---  
2 title: "Getting Started with R and RStudio"  
3 output: html_document  
4 ---  
5  
6 <!-- This file by Charlotte Wickham is licensed under a Creative  
7 Commons Attribution 4.0 International License. -->  
8  
9 `r setup`  
10 library(tidyverse)  
11 ...  
12  
13 ## R Markdown  
14  
15 This is an [R Markdown](http://rmarkdown.rstudio.com) file (it  
16 has a .Rmd file extension). When you execute code within the  
17 file, the results appear beneath the code.  
18  
19 R code goes in **code chunks**, denoted by three backticks. Try  
20 executing this chunk by clicking the *Run* button (a small green  
21 triangle) within the chunk or by placing your cursor inside it  
and pressing *Ctrl+Shift+Enter* (or *Cmd+Shift+Enter* on Mac).  
22  
23  
24 `r`  
25 ggplot(data = mpg) +  
26   geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)  
27 ...
```

37:1 C Chunk 4

Console Terminal R Markdown

~/Documents/Projects/BC\_Stats/ ↵

# RMarkdown

An authoring format for  
Data Science

01-Getting-started.Rmd  
is an RMarkdown file.

```
01-Getting-started.Rmd x
ABC Knit Insert Run

1 ---  
2 title: "Getting Started with R and RStudio"  
3 output: html_document  
4 ---  
5  
6 <!-- This file by Charlotte Wickham is licensed under a Creative  
Commons Attribution 4.0 International License. -->  
7  
8 ```{r setup}  
9 library(tidyverse)  
10 ````  
11  
12 ## R Markdown  
13  
14 This is an [R Markdown](http://rmarkdown.rstudio.com) file (it  
has a .Rmd file extension). When you execute code within the  
file, the results appear beneath the code.  
15  
16 R code goes in **code chunks**, denoted by three backticks. Try  
executing this chunk by clicking the *Run* button (a small green  
triangle) within the chunk or by placing your cursor inside it  
and pressing *Ctrl+Shift+Enter* (or *Cmd+Shift+Enter* on Mac).  
17  
18 ```{r}  
19 ggplot(data = mpg) +  
20   geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)  
21 ````
```

37:1 C Chunk 4 R Markdown

Console Terminal R Markdown

~/Documents/Projects/BC\_Stats/

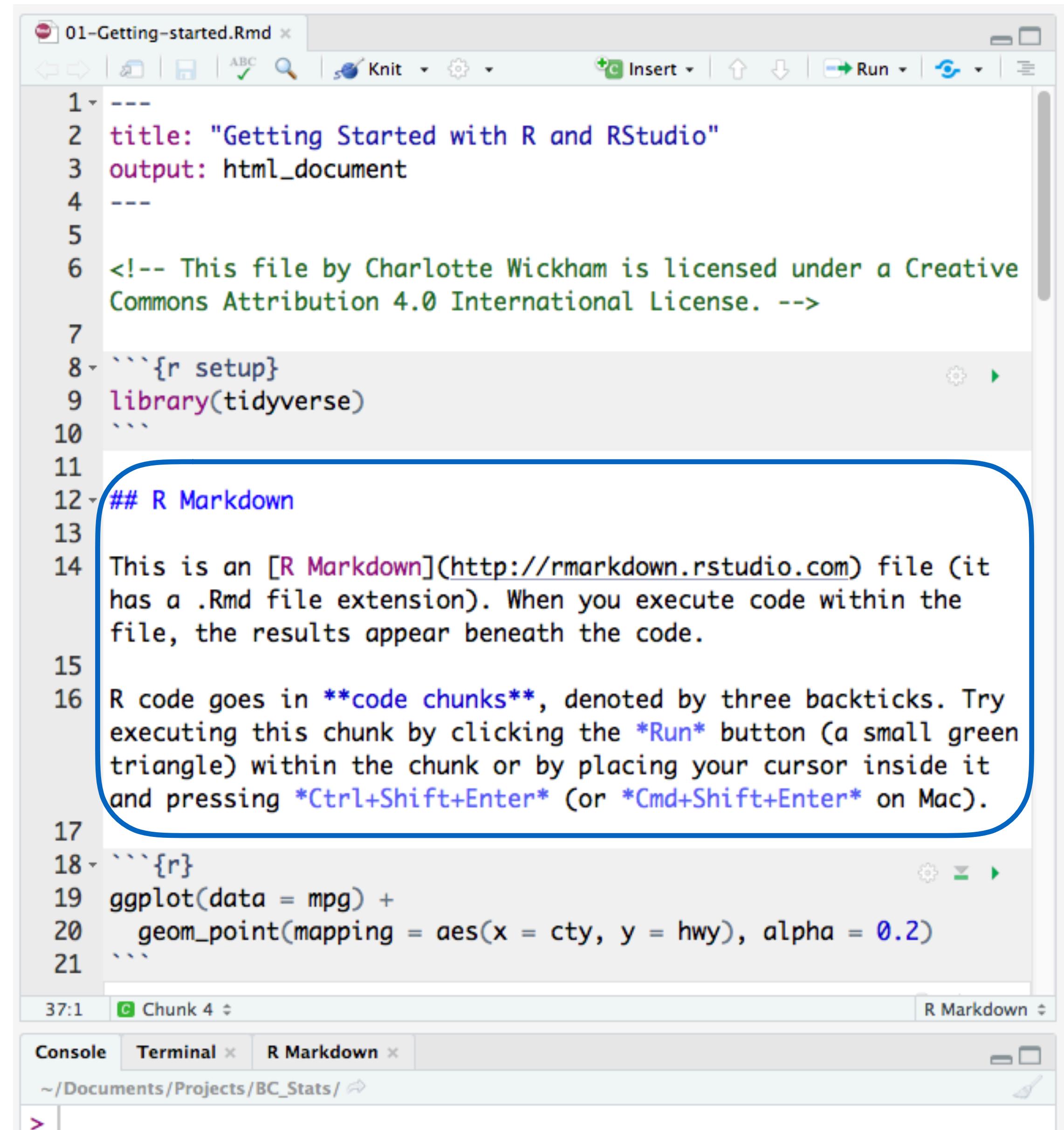
# RMarkdown

An authoring format for  
Data Science

01-Getting-started.Rmd  
is an RMarkdown file.

Integrates:

- Code



```
01-Getting-started.Rmd x
ABC Knit Insert Run

1 ---  
2 title: "Getting Started with R and RStudio"  
3 output: html_document  
4 ---  
5  
6 <!-- This file by Charlotte Wickham is licensed under a Creative  
Commons Attribution 4.0 International License. -->  
7  
8 ```{r setup}  
9 library(tidyverse)  
10 ...  
11  
12 ## R Markdown  
13  
14 This is an [R Markdown](http://rmarkdown.rstudio.com) file (it  
has a .Rmd file extension). When you execute code within the  
file, the results appear beneath the code.  
15  
16 R code goes in **code chunks**, denoted by three backticks. Try  
executing this chunk by clicking the *Run* button (a small green  
triangle) within the chunk or by placing your cursor inside it  
and pressing *Ctrl+Shift+Enter* (or *Cmd+Shift+Enter* on Mac).  
17  
18 ```{r}  
19 ggplot(data = mpg) +  
20   geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)  
21 ...
```

37:1 C Chunk 4 R Markdown

Console Terminal R Markdown

~/Documents/Projects/BC\_Stats/ ↵

# RMarkdown

## An authoring format for Data Science

01-Getting-started.Rmd is an RMarkdown file.

Integrates:

- Code
- Text

```
01-Getting-started.Rmd x
ABC Knit Insert Run

1 ---  
2 title: "Getting Started with R and RStudio"  
3 output: html_document  
4 ---  
5  
6 <!-- This file by Charlotte Wickham is licensed under a Creative  
7 Commons Attribution 4.0 International License. -->  
8 `r setup`  
9 library(tidyverse)  
10 ...  
11  
12 ## R Markdown  
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16 R code goes in **code chunks**, denoted by three backticks. Try  
executing this chunk by clicking the *Run* button (a small green  
triangle) within the chunk or by placing your cursor inside it  
and pressing *Ctrl+Shift+Enter* (or *Cmd+Shift+Enter* on Mac).  
17  
18 `r`  
19 ggplot(data = mpg) +  
20   geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)  
21 ...
```

37:1 C Chunk 4 R Markdown

Console Terminal R Markdown

~/Documents/Projects/BC\_Stats/ ↵

# RMarkdown

## An authoring format for Data Science

01-Getting-started.Rmd  
is an RMarkdown file.

### Integrates:

- Code
- Text
- Output

# Your Turn

Read the instructions.  
Run the code by hitting  
the play button,  
or using the keyboard  
shortcut.

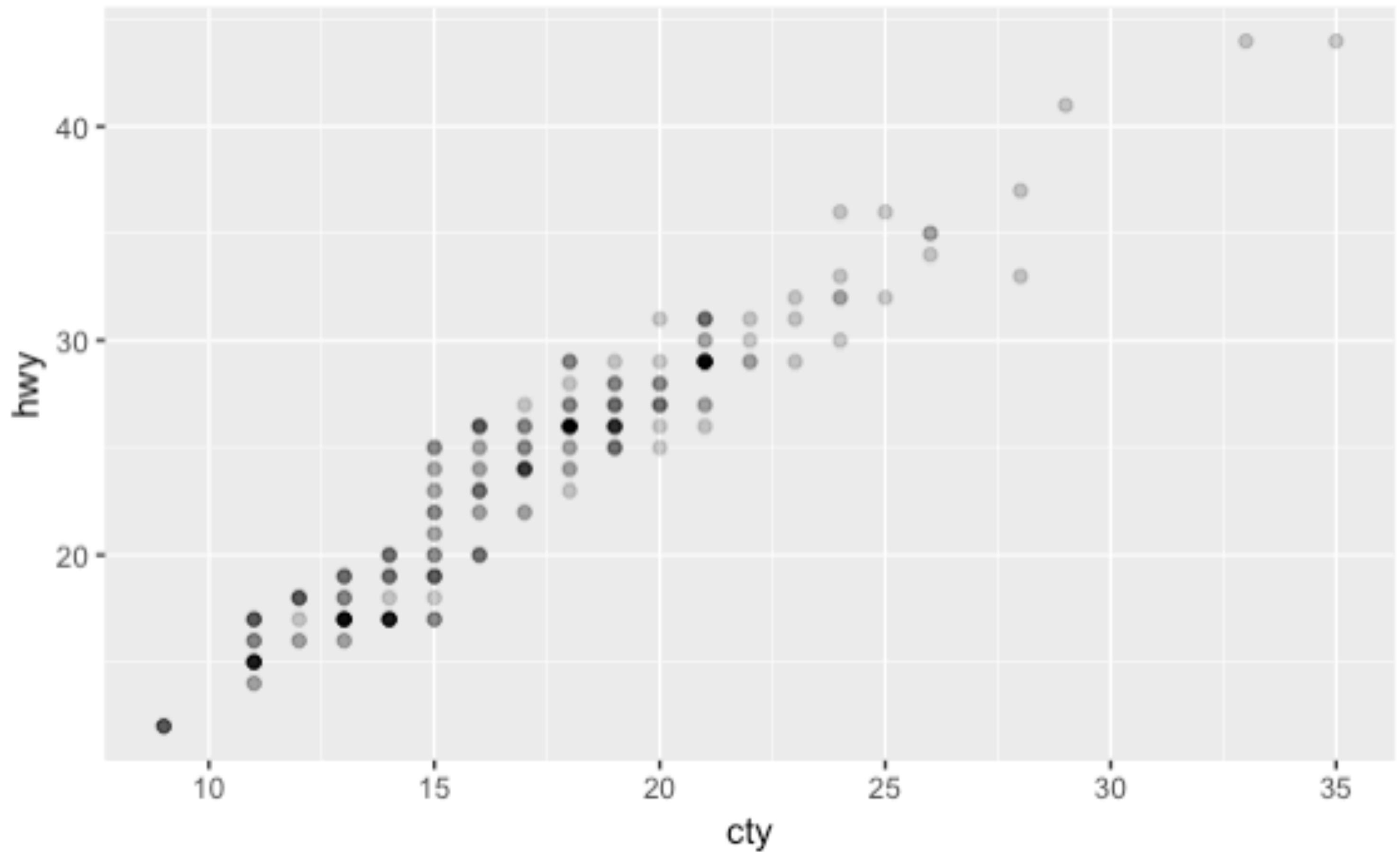
```
01-Getting-started.Rmd x
Knit Insert Run

1 ---  
2 title: "Getting Started with R and RStudio"  
3 output: html_document  
4 ---  
5  
6 <!-- This file by Charlotte Wickham is licensed under a Creative  
Commons Attribution 4.0 International License. -->  
7  
8 ```{r setup}  
9 library(tidyverse)  
10```  
11  
12 ## R Markdown  
13  
14 This is an [R Markdown](http://rmarkdown.rstudio.com) file (it  
has a .Rmd file extension). When you execute code within the  
file, the results appear beneath the code.  
15  
16 R code goes in **code chunks**, denoted by three backticks. Try  
executing this chunk by clicking the *Run* button (a small green  
triangle) within the chunk or by placing your cursor inside it  
and pressing *Ctrl+Shift+Enter* (or *Cmd+Shift+Enter* on Mac).  
17  
18 ```{r}  
19 ggplot(data = mpg) +  
20   geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)  
21```

37:1 C Chunk 4 R Markdown

Console Terminal R Markdown
~/Documents/Projects/BC_Stats/ >
```

```
```{r}
ggplot(data = mpg) +
  geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)
```
```



Click to run code  
in chunk

Click to run all  
code chunks  
above

Code result

# Your Turn

Keep going!

Add a new code chunk.

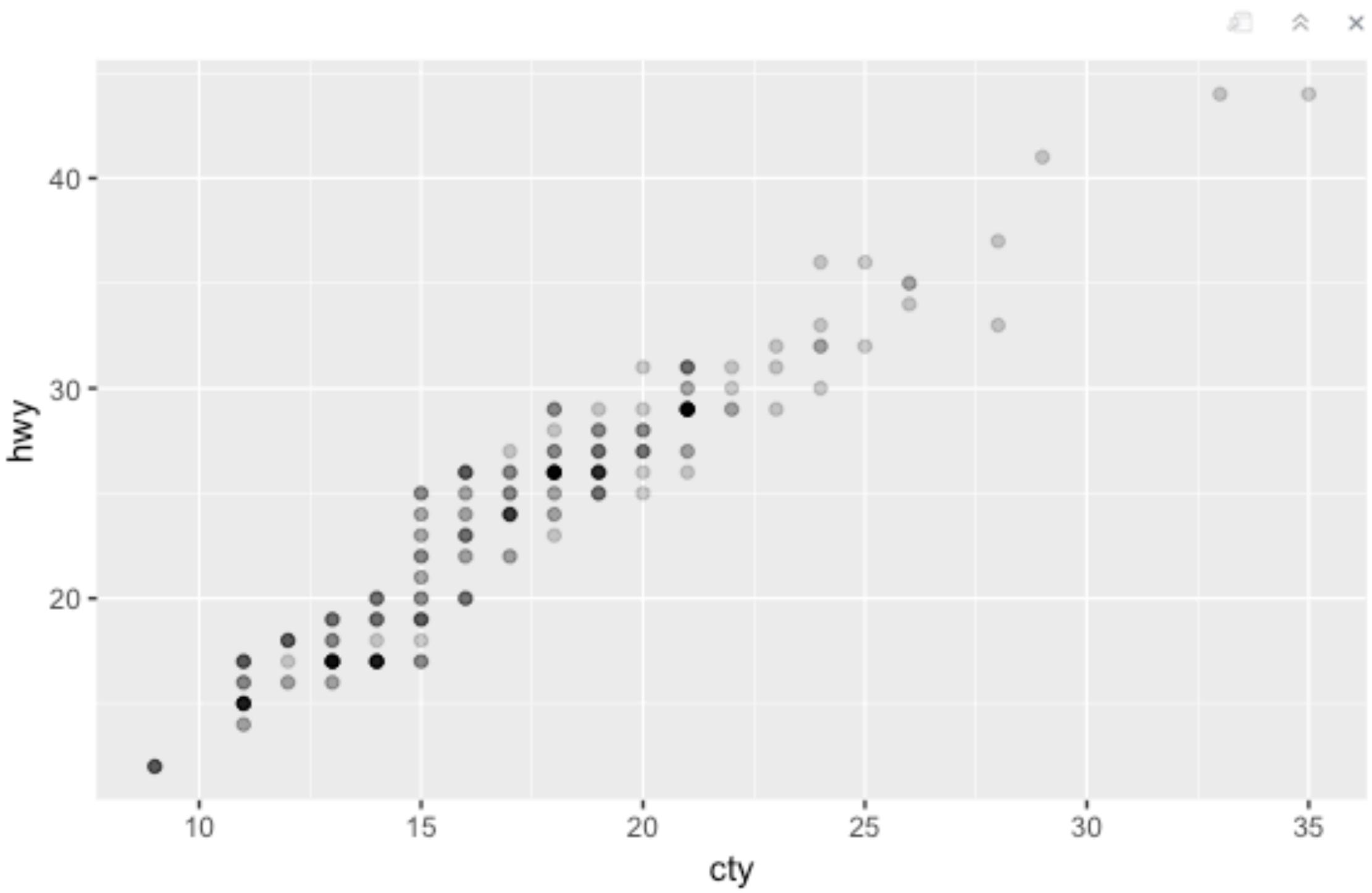
Put:

$$2 + 2$$

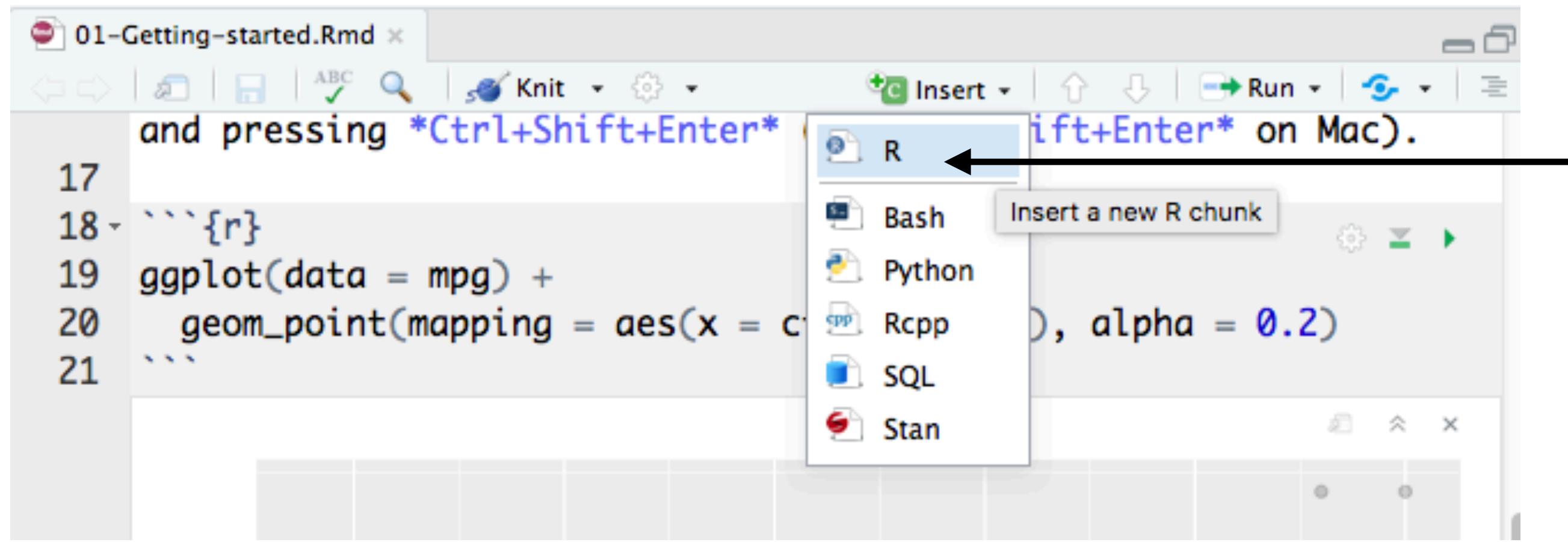
in your new chunk and run it.

executing this chunk by clicking the **\*Run\*** button (a small green triangle) within the chunk or by placing your cursor inside it and pressing **\*Ctrl+Shift+Enter\*** (or **\*Cmd+Shift+Enter\*** on Mac).

```
17  
18 - ``{r}  
19 ggplot(data = mpg) +  
20   geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)  
21 ...
```



```
22  
23 - ## Add a new code chunk  
24  
25 Add a new code chunk by clicking the *Insert Chunk* button on the  
toolbar or by pressing *Cmd/Ctrl+Option+I*.  
26  
27 Put 2 + 2 in your new code chunk and run it.  
28
```

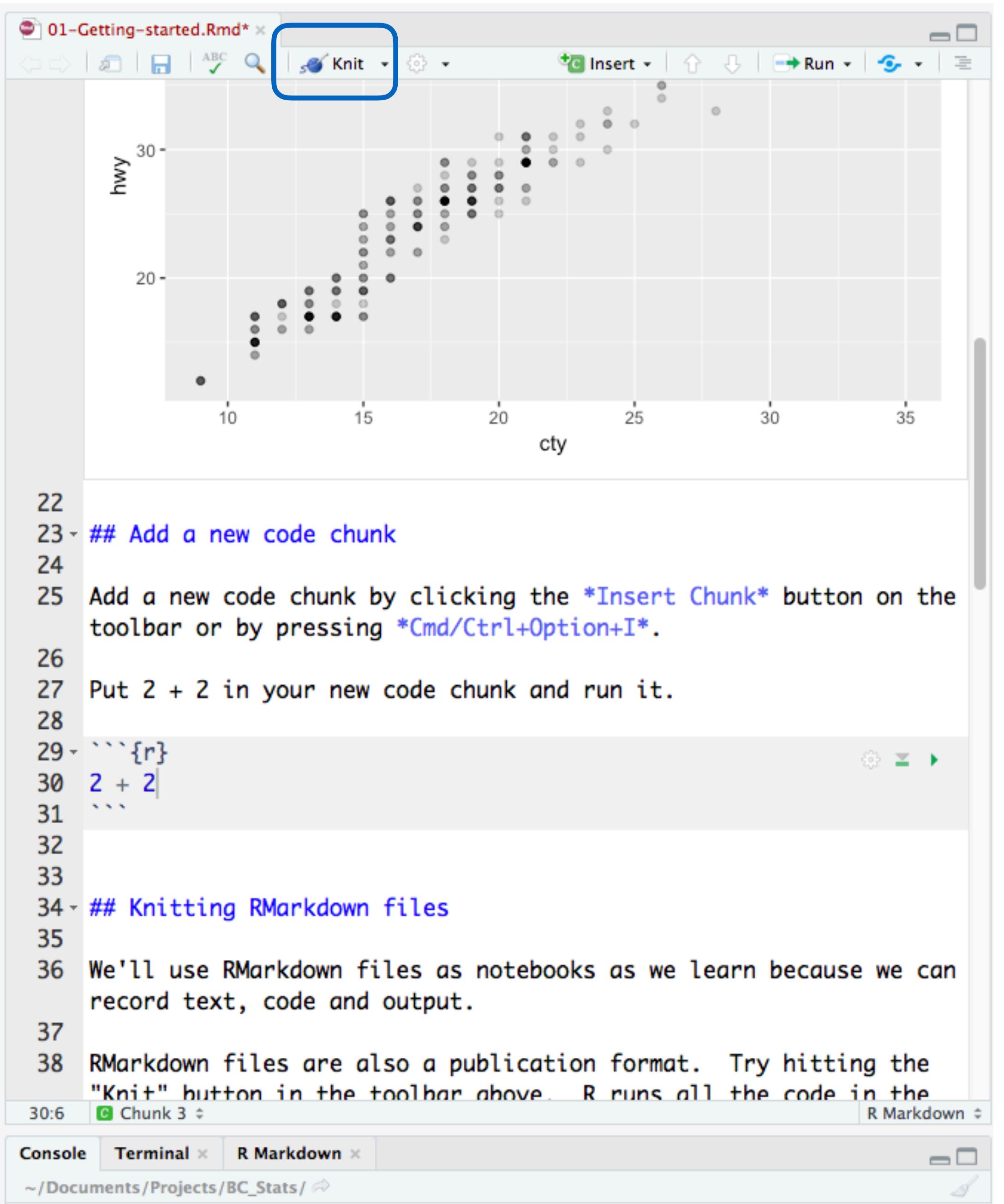


Insert new code chunk

Ctrl + Alt + I (Windows)

Cmd + Option + I (Mac)

```
27 Put 2 + 2 in your new code chunk and run it.  
28  
29 ```{r}  
30 2 + 2  
31 ```  
32  
33
```



# RMarkdown

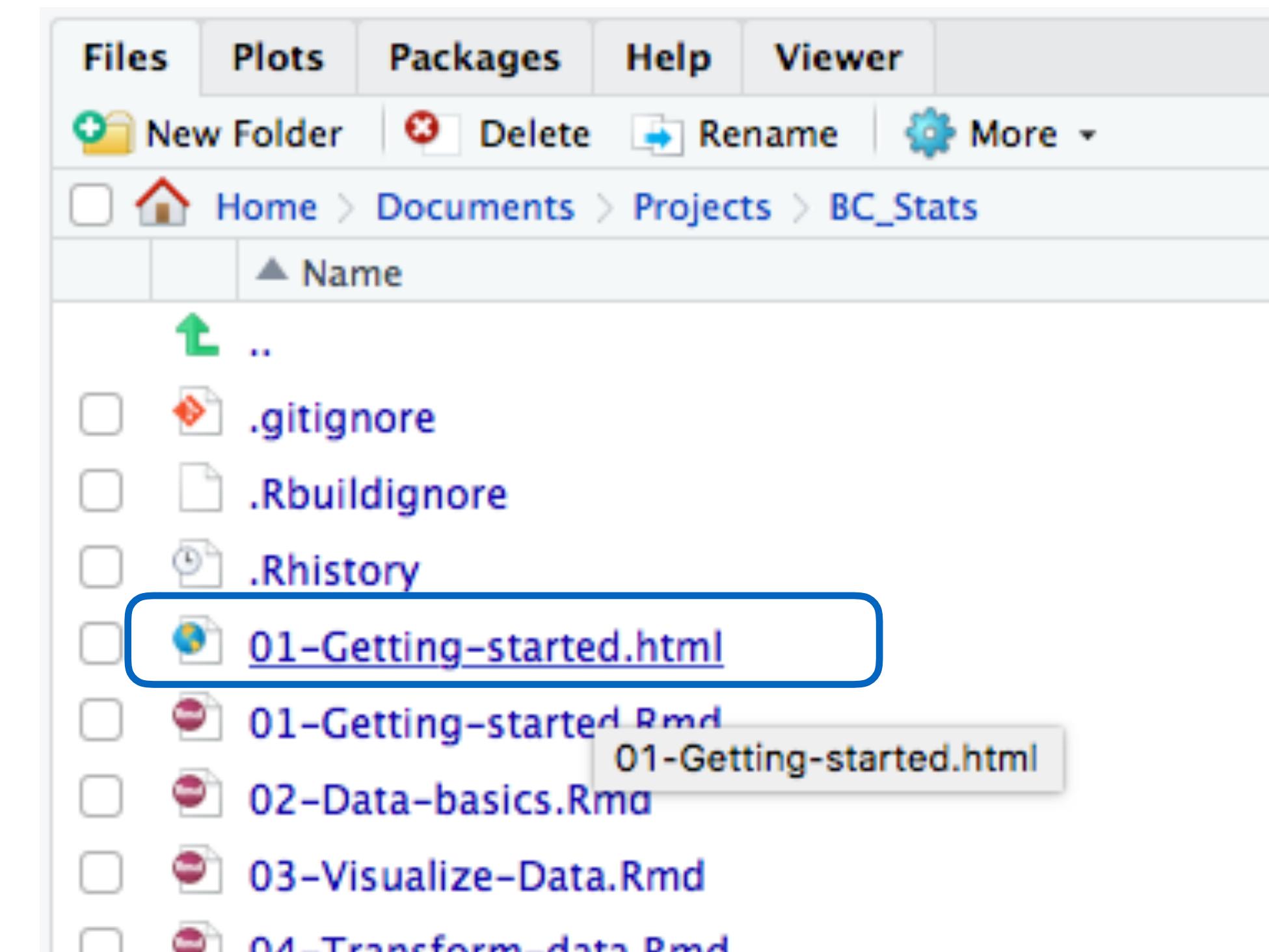
Also a way publish your work. You can create an HTML version, by hitting Knit.

The screenshot shows the RStudio interface. At the top, there's a toolbar with various icons. A blue box highlights the "Knit" button, which is located next to the "Insert" and "Run" buttons. Below the toolbar is a scatter plot with "hwy" on the y-axis (ranging from 10 to 35) and "cty" on the x-axis (ranging from 10 to 35). The plot area contains numerous small gray dots representing data points. Below the plot is a code editor window displaying R Markdown code. The code includes a code chunk for calculating  $2 + 2$  and a section on knitting R Markdown files.

```
22
23 ## Add a new code chunk
24
25 Add a new code chunk by clicking the *Insert Chunk* button on the
26 tool or by pressing *Cmd/Ctrl+Option+I*.
27 Put  $2 + 2$  in your new code chunk and run it.
28
29 ```{r}
30 2 + 2
31 ```
32
33
34 ## Knitting RMarkdown files
35
36 We'll use RMarkdown files as notebooks as we learn because we can
37 record text, code and output.
38 RMarkdown files are also a publication format. Try hitting the
39 "Knit" button in the toolbar above. R runs all the code in the
40 file.
41
```

# RMarkdown

The result is stand-alone,  
you can email it to your  
friends.



# RMarkdown

An easy way to combine R code and narrative

Useful for us:

- I'll provide starter code
- You can complete "Your Turns"
- At the end, a useful record for you

# Your Turn

1. Spot the difference

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

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

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

```
30
31 ## Assigning variables
32
33 What's the difference between the code in this
34 chunk:
35 ```{r}
36 filter(mtcars, cyl == 4)
37 ...
38 And the code in this chunk?
39 ```{r}
40 four_cyls <- filter(mtcars, cyl == 4)
41 ...
42
```

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

Does something (?) and output is displayed

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

Does the exact same thing but output is stored in variable four\_cyls

# Assignment

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

Assign the output from the right hand side,  
to a variable with the name on the left hand side

<-

The assignment operator, 'less than symbol' 'dash'

A screenshot of the RStudio interface. The top bar shows the project path: ~/Documents/Projects/BC\_Stats - master - RStudio. The left pane contains a code editor with an R Markdown file named '01-Getting-started.Rmd'. The code includes several chunks of R code, some of which are highlighted in blue. The right pane shows the 'Environment' tab of the global environment viewer, displaying a dataset named 'four\_cyls' with 11 observations and 11 variables.

```
27 When you save the notebook, an HTML file containing the code and output will be saved alongside it (click the *Preview* button or press *Cmd+Shift+K* to preview the HTML file).
28
29 The preview shows you a rendered HTML copy of the contents of the editor. Consequently, unlike *Knit*, *Preview* does not run any R code chunks. Instead, the output of the chunk when it was last run in the editor is displayed.
30
31 ## Assigning variables
32
33 What's the difference between the code in this chunk:
34 ```{r}
35 filter(mtcars, cyl == 4)
36 ```
37
38 And the code in this chunk?
39 ```{r}
40 four_cyls <- filter(mtcars, cyl == 4)
42:1 # Assigning variables
```

# Environment

All the variables you have stored

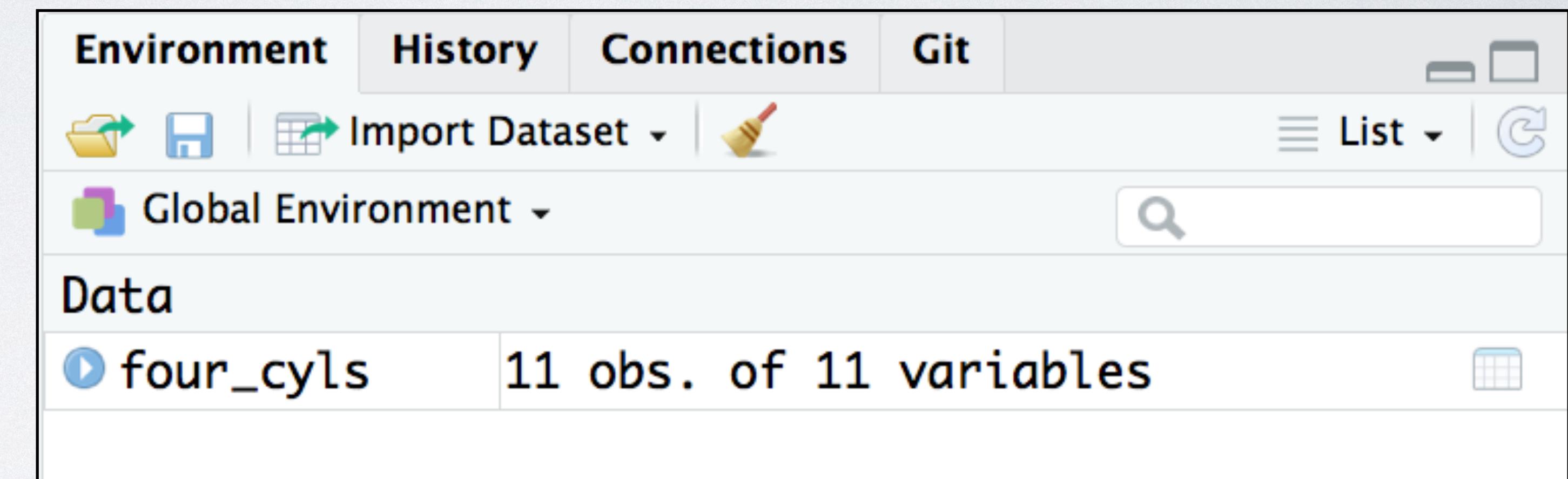


# Your Turn

Find `four_cyls` in  
the environment pane.

Click on the name  
`four_cyls`.

What happens? What  
is this object?



# Clicking on an object in the Environment will open an interactive Viewer

The screenshot shows the RStudio interface. In the top-left corner, there's a preview of the 'four\_cyls' dataset in the 'Environment' pane, displaying the first 10 rows of a data frame with columns: mpg, cyl, disp, hp, drat, wt, qsec, vs. The top-right corner shows the 'BC\_Stats' project in the 'Environment' tab. The bottom-left corner shows the R console output:

```
> 2 + 2
[1] 4
> filter(mtcars, cyl == 4)
> four_cyls <- filter(mtcars, cyl == 4)
> filter(mtcars, cyl == 4)
> four_cyls <- filter(mtcars, cyl == 4)
> View(four_cyls)
> View(four_cyls)
>
```

The bottom-right corner shows the 'Viewer' pane with an interactive viewer for the 'four\_cyls' dataset, showing the same 10 rows of data.

|   | mpg  | cyl | disp  | hp | drat | wt    | qsec  | vs |
|---|------|-----|-------|----|------|-------|-------|----|
| 1 | 22.8 | 4   | 108.0 | 93 | 3.85 | 2.320 | 18.61 |    |
| 2 | 24.4 | 4   | 146.7 | 62 | 3.69 | 3.190 | 20.00 |    |
| 3 | 22.8 | 4   | 140.8 | 95 | 3.92 | 3.150 | 22.90 |    |
| 4 | 32.4 | 4   | 78.7  | 66 | 4.08 | 2.200 | 19.47 |    |
| 5 | 30.4 | 4   | 75.7  | 52 | 4.93 | 1.615 | 18.52 |    |
| 6 | 33.9 | 4   | 71.1  | 65 | 4.22 | 1.835 | 19.90 |    |
| 7 | 21.5 | 4   | 120.1 | 97 | 3.70 | 2.465 | 20.01 |    |
| 8 | 27.3 | 4   | 79.0  | 66 | 4.08 | 1.935 | 18.90 |    |
| 9 | 26.0 | 4   | 120.3 | 91 | 4.43 | 2.140 | 16.70 |    |

# Basic Syntax

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

A function

Functions do things in R

Functions take arguments, and output results

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

# Basic Syntax

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

To call a function, you need to know its  
**name**,

and the **arguments** it is expecting.

Arguments are comma separated and go  
inside the parenthesis following the function  
name.

?

for help on functions

To get help on a function in R, on the  
Console, type

?function\_name

# Your Turn

Try  
?filter

The screenshot shows the RStudio interface with the 'filter' function help page open in the 'Viewer' tab. The 'filter' function is described as returning rows with matching conditions from a data frame or tibble. It notes that unlike base subsetting, rows where the condition evaluates to NA are dropped. The 'Usage' section shows the syntax: filter(.data, ...). The 'Arguments' section is partially visible at the bottom. A large black arrow points from the 'filter' help page in RStudio down to the 'filter {dplyr}' documentation page.

Help on topic 'filter' was found in the following packages:

[Return rows with matching conditions](#)  
(in package [dplyr](#) in library /Users/wickhamc/R)  
[Linear Filtering on a Time Series](#)  
(in package [stats](#) in library  
/Library/Frameworks/R.framework/Versions/3.4/Resources

## filter {dplyr}

R Documentation

# Return rows with matching conditions

## Description

Use `filter()` find rows/cases where conditions are true. Unlike base subsetting, rows where the condition evaluates to `NA` are dropped.

## Usage

```
filter(.data, ...)
```

## Arguments

## Return rows with matching conditions

### Description

Use `filter()` find rows/cases where conditions are true. Unlike base subsetting, rows where the condition evaluates to `NA` are dropped.

### Usage

```
filter(.data, ...)
```

### Arguments

## Return rows with matching conditions

### Description

Use `filter()` find rows/cases where conditions are true. Unlike base subsetting, rows where the condition evaluates to `NA` are dropped.

### Usage

```
filter(.data, ...)
```

### Arguments

`.data` A `tbl`. All main verbs are S3 generics and provide methods for `tbl_df()`, `dplyr::tbl_dt()` and `dbplyr::tbl_dbi()`.

`...` Logical predicates defined in terms of the variables in `.data`. Multiple conditions are combined with `&`. Only rows where the condition evaluates to `TRUE` are kept.

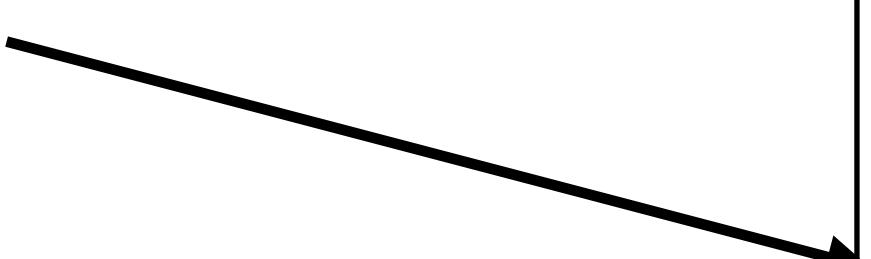
These arguments are automatically [quoted](#) and [evaluated](#) in the context of the data frame. They support [unquoting](#) and splicing. See `vignette("programming")` for an introduction to these concepts.

### Details

Note that `dplyr` is not yet smart enough to optimise filtering optimisation on grouped datasets that don't need grouped calculations. For this reason, filtering is often considerably faster on [ungroup\(\)](#)ed data.

# Arguments

A named argument `.data`  
• • • Some other  
unnamed  
arguments



Naming arguments is optional,  
unnamed arguments are used in the order they are given

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

the first argument should take  
the value mtcars

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

the .data argument should  
take the value mtcars

# Your Turn

Take a look at the next chunk.

1. What functions are being called?
2. What arguments do they take?
3. What values are being passed as which arguments?

```
46  
47 - `^`{r}  
48 heights <- pull(.data = starwars, var = height)  
49 mean(heights, na.rm = TRUE)  
50 ...  
51 |
```

```
heights <- pull(.data = starwars, var = height)
```

`pull()` is being called with the `.data` argument being `starwars`, and the `var` argument being `height`

```
mean(heights, na.rm = TRUE)
```

`mean()` is being called with the `x` argument being `heights`, and the `na.rm` argument being `TRUE`

# Common Syntax problem

## #1

Missing closing parenthesis or quotes

```
mean(heights)
```

```
"Oops I'm stuck in a string
```

# Common Syntax problem

## #2

Surrounding something in quotes, when R expected something else (or vice versa), e.g.

```
> mean("heights")
[1] NA

Warning message:
In mean.default("heights") :
  argument is not numeric or logical: returning NA
```

# Your Turn

There are three chunks under "Syntax gone wrong".

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

```
sd(pull(.data = starwars, var = weight))
```

```
my_name <- "Charlotte"
```

```
pull(.data = starwars, var = height)
```

# Getting Started with R and RStudio

# Summary

Use RMarkdown to keep together code, output and text.

If you need to use output, assign it to a variable

```
<-
```

Get help on a function with ?

Watch your ( , "

# RStudio IDE :: CHEAT SHEET

## Documents and Apps



Open Shiny, R Markdown, knitr, Sweave, LaTeX, .Rd 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 selected lines   Publish to server   Show file outline

Access markdown guide at [Help > Markdown Quick Reference](#)

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

```{r pressure, echo=FALSE}

plot(pressure)

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

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

File Edit Code View Plots Session Build Debug Tools Help Addins

R Markdown

Source on Save

Run App

|                                   |                        |                      |                          |                          |                         |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------|------------------------|----------------------|--------------------------|--------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1 LAYOUT</b>                   | <b>Windows/Linux</b>   | <b>Mac</b>           | <b>4 WRITE CODE</b>      | <b>Windows /Linux</b>    | <b>Mac</b>              | <b>WHY RSTUDIO SERVER PRO?</b>                                                                                                                                                                                                                                                                                                                                                                                         |
| Move focus to Source Editor       | Ctrl+1                 | Ctrl+1               | Attempt completion       | Tab or Ctrl+Space<br>↑/↓ | Tab or Cmd+Space<br>↑/↓ | RSP extends the open source server with a commercial license, support, and more:                                                                                                                                                                                                                                                                                                                                       |
| Move focus to Console             | Ctrl+2                 | Ctrl+2               | Navigate candidates      | Enter, Tab, or →         | Enter, Tab, or →        | <ul style="list-style-type: none"> <li>open and run multiple R sessions at once</li> <li>tune your resources to improve performance</li> <li>edit the same project at the same time as others</li> <li>see what you and others are doing on your server</li> <li>switch easily from one version of R to a different version</li> <li>integrate with your authentication, authorization, and audit practices</li> </ul> |
| Move focus to Help                | Ctrl+3                 | Ctrl+3               | Accept candidate         | Esc                      | Esc                     |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Show History                      | Ctrl+4                 | Ctrl+4               | Dismiss candidates       | Ctrl+Z                   | Cmd+Z                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Show Files                        | Ctrl+5                 | Ctrl+5               | Undo                     | Ctrl+Shift+Z             | Cmd+Shift+Z             |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Show Plots                        | Ctrl+6                 | Ctrl+6               | Redo                     | Ctrl+X                   | Cmd+X                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Show Packages                     | Ctrl+7                 | Ctrl+7               | Cut                      | Ctrl+C                   | Cmd+C                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Show Environment                  | Ctrl+8                 | Ctrl+8               | Copy                     | Ctrl+V                   | Cmd+V                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Show Git/SVN                      | Ctrl+9                 | Ctrl+9               | Paste                    | Ctrl+A                   | Cmd+A                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Show Build                        | Ctrl+0                 | Ctrl+0               | Select All               | Ctrl+D                   | Cmd+D                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                   |                        |                      | Delete Line              |                          |                         |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>2 RUN CODE</b>                 | <b>Windows/Linux</b>   | <b>Mac</b>           |                          |                          |                         |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Search command history</b>     | <b>Ctrl+↑</b>          | <b>Cmd+↑</b>         | Select                   | Shift+[Arrow]            | Shift+[Arrow]           | <b>5 DEBUG CODE</b>                                                                                                                                                                                                                                                                                                                                                                                                    |
| Navigate command history          | ↑/↓                    | ↑/↓                  | Select Word              | Ctrl+Shift+↔/↔           | Option+Shift+↔/↔        | <b>Windows/Linux</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
| Move cursor to start of line      | Home                   | Cmd+←                | Select to Line Start     | Alt+Shift+←              | Cmd+Shift+←             | <b>Mac</b>                                                                                                                                                                                                                                                                                                                                                                                                             |
| Move cursor to end of line        | End                    | Cmd+→                | Select to Line End       | Alt+Shift+→              | Cmd+Shift+→             |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Change working directory          | Ctrl+Shift+H           | Ctrl+Shift+H         | Select Page Up/Down      | Shift+PageUp/Down        | Shift+PageUp/Down       |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Interrupt current command</b>  | <b>Esc</b>             | <b>Esc</b>           | Select to Start/End      | Shift+Alt+↑/↓            | Cmd+Shift+↑/↓           |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Clear console</b>              | <b>Ctrl+L</b>          | <b>Ctrl+L</b>        | Delete Word Left         | Ctrl+Backspace           | Ctrl+Opt+Backspace      |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Quit Session (desktop only)       | Ctrl+Q                 | Cmd+Q                | Delete Word Right        |                          | Option+Delete           |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                   |                        |                      | Delete to Line End       |                          | Ctrl+K                  |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Restart R Session</b>          | <b>Ctrl+Shift+F10</b>  | <b>Cmd+Shift+F10</b> | Delete to Line Start     |                          | Option+Backspace        | <b>6 VERSION CONTROL</b>                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Run current line/selection</b> | <b>Ctrl+Enter</b>      | <b>Cmd+Enter</b>     | Indent                   | Tab (at start of line)   | Tab (at start of line)  | <b>Windows/Linux</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
| Run current (retain cursor)       | Alt+Enter              | Option+Enter         | Outdent                  | Shift+Tab                | Shift+Tab               | <b>Mac</b>                                                                                                                                                                                                                                                                                                                                                                                                             |
| Run from current to end           | Ctrl+Alt+E             | Cmd+Option+E         | Yank line up to cursor   | Ctrl+U                   | Ctrl+U                  |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Run the current function          | Ctrl+Alt+F             | Cmd+Option+F         | Yank line after cursor   | Ctrl+K                   | Ctrl+K                  |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Source a file                     | Ctrl+Alt+G             | Cmd+Option+G         | Insert yanked text       | Ctrl+Y                   | Ctrl+Y                  |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Source the current file</b>    | <b>Ctrl+Shift+S</b>    | <b>Cmd+Shift+S</b>   | Insert <-                | Alt+-                    | Option+-                | <b>7 MAKE PACKAGES</b>                                                                                                                                                                                                                                                                                                                                                                                                 |
| Source with echo                  | Ctrl+Shift+Enter       | Cmd+Shift+Enter      | Insert %>%               | Ctrl+Shift+M             | Cmd+Shift+M             | <b>Windows/Linux</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                   |                        |                      | Show help for function   | F1                       | F1                      | <b>Mac</b>                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>3 NAVIGATE CODE</b>            | <b>Windows /Linux</b>  | <b>Mac</b>           | Show source code         | F2                       | F2                      |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Goto File/Function</b>         | <b>Ctrl+. .</b>        | <b>Ctrl+. .</b>      | New document             | Ctrl+Shift+N             | Cmd+Shift+N             |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Fold Selected                     | Alt+L                  | Cmd+Option+L         | New document (Chrome)    | Ctrl+Alt+Shift+N         | Cmd+Shift+Opt+N         |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Unfold Selected                   | Shift+Alt+L            | Cmd+Shift+Option+L   | Open document            | Ctrl+O                   | Cmd+O                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Fold All                          | Alt+O                  | Cmd+Option+O         | Save document            | Ctrl+S                   | Cmd+S                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Unfold All                        | Shift+Alt+O            | Cmd+Shift+Option+O   | Close document           | Ctrl+W                   | Cmd+W                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Go to line                        | Shift+Alt+G            | Cmd+Shift+Option+G   | Close document (Chrome)  | Ctrl+Alt+W               | Cmd+Option+W            |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Jump to                           | Shift+Alt+J            | Cmd+Shift+Option+J   | Close all documents      | Ctrl+Shift+W             | Cmd+Shift+W             |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Switch to tab                     | Ctrl+Shift+.           | Ctrl+Shift+.         | Extract function         | Ctrl+Alt+X               | Cmd+Option+X            |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Previous tab                      | Ctrl+F11               | Ctrl+F11             | Extract variable         | Ctrl+Alt+V               | Cmd+Option+V            |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Next tab                          | Ctrl+F12               | Ctrl+F12             | Reindent lines           | Ctrl+I                   | Cmd+I                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| First tab                         | Ctrl+Shift+F11         | Ctrl+Shift+F11       | <b>(Un)Comment lines</b> | <b>Ctrl+Shift+C</b>      | <b>Cmd+Shift+C</b>      | <b>8 DOCUMENTS AND APPS</b>                                                                                                                                                                                                                                                                                                                                                                                            |
| Last tab                          | Ctrl+Shift+F12         | Ctrl+Shift+F12       | Reflow Comment           | Ctrl+Shift+/             | Cmd+Shift+/             | <b>Windows/Linux</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
| Navigate back                     | Ctrl+F9                | Cmd+F9               | Reformat Selection       | Ctrl+Shift+A             | Cmd+Shift+A             | <b>Mac</b>                                                                                                                                                                                                                                                                                                                                                                                                             |
| Navigate forward                  | Ctrl+F10               | Cmd+F10              | Select within braces     | Ctrl+Shift+E             | Cmd+Shift+E             |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Jump to Brace                     | Ctrl+P                 | Ctrl+P               | Show Diagnostics         | Ctrl+Shift+Alt+P         | Cmd+Shift+Opt+P         |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Select within Braces              | Ctrl+Shift+Alt+E       | Ctrl+Shift+Option+E  | Transpose Letters        | Ctrl+T                   | Ctrl+T                  |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Use Selection for Find            | Ctrl+F3                | Cmd+E                | Move Lines Up/Down       | Alt+↑/↓                  | Option+↑/↓              |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Find in Files                     | Ctrl+Shift+F           | Cmd+Shift+F          | Copy Lines Up/Down       | Shift+Alt+↑/↓            | Cmd+Option+↑/↓          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Find Next                         | Win: F3, Linux: Ctrl+G | Cmd+G                | Add New Cursor Above     | Ctrl+Alt+Up              | Ctrl+Option+Up          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Find Previous                     | W: Shift+F3, L:        | Cmd+Shift+G          | Add New Cursor Below     | Ctrl+Alt+Down            | Ctrl+Option+Down        |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Jump to Word                      | Ctrl+↔/↔               | Option+↔/↔           | Move Active Cursor Up    | Ctrl+Alt+Shift+Up        | Ctrl+Option+Shift+Up    |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Jump to Start/End                 | Ctrl+↑/↓               | Cmd+↑/↓              | Move Active Cursor Down  | Ctrl+Alt+Shift+Down      | Ctrl+Opt+Shift+Down     |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Toggle Outline                    | Ctrl+Shift+O           | Cmd+Shift+O          | Find and Replace         | Ctrl+F                   | Cmd+F                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                   |                        |                      | Use Selection for Find   | Ctrl+F3                  | Cmd+E                   |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                   |                        |                      | Replace and Find         | Ctrl+Shift+J             | Cmd+Shift+J             |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                   |                        |                      |                          |                          |                         | <b>Show Keyboard Shortcuts</b>                                                                                                                                                                                                                                                                                                                                                                                         |
|                                   |                        |                      |                          |                          |                         | <b>Alt+Shift+K</b>                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                   |                        |                      |                          |                          |                         | <b>Option+Shift+K</b>                                                                                                                                                                                                                                                                                                                                                                                                  |



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# Your Turn

Open 02-Data-basics.Rmd