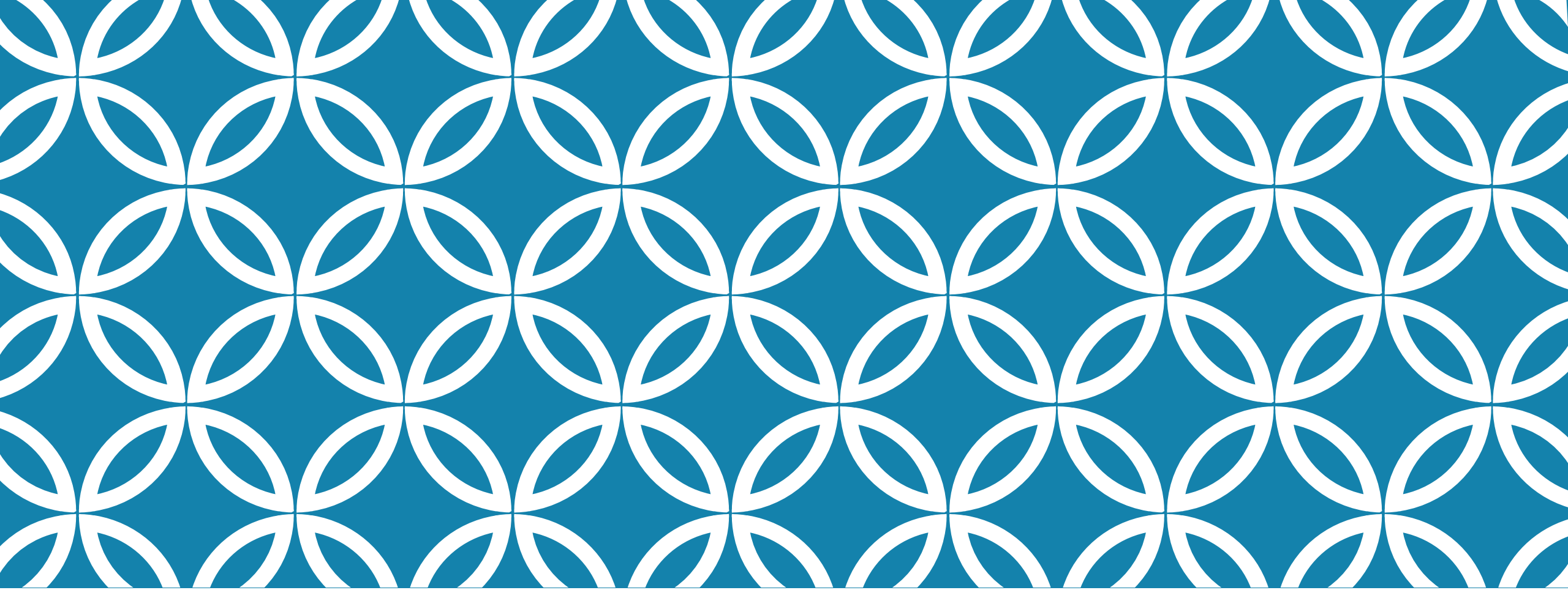


# Introduction to R and R Studio

Session 1

**Joseph Rudolf**

December 13, 2020

# Lesson Goals

1. Get oriented to R and RStudio
2. Learn some fundamentals of coding

# Lesson Objectives

1. Log in and tour RStudio Cloud
2. Execute code at the console
3. Define and use functions
4. Define and create objects in the environment
5. Load data into R and interact with a dataframe

# Getting Oriented to R

# What is R?

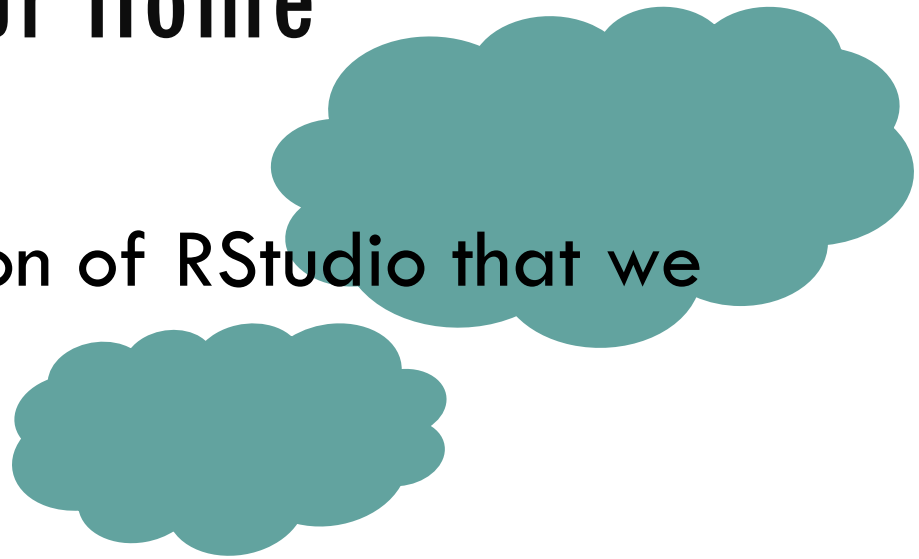
- R is a statistical programming language.
- Using R you can load, analyze, and visualize data.
- R also provides an environment in which we can conduct reproducible data analysis.
  - Documented
  - Revisable
  - Shareable

# RStudio: The Portal to R

- RStudio is an integrated development environment (IDE)

- Using RStudio we can interact with the R programming language to:
  - Write and execute code interactively
  - View data
  - Debug and fix errors
  - Author our code

# RStudio: In the Cloud… In Your Home



- RStudio Cloud: An online hosted version of RStudio that we will use for these course sessions

- RStudio Desktop: A locally installed version of RStudio that you will use when you get home to continue your learning

**Note: Use Rstudio Cloud only for this course. Do not upload protected health information to the cloud!**

# Your Turn

Navigate to: **https://tinyurl.com/r-aacc-2020**

Enter your log in credentials

Join Space

Make a copy of the Core Exercises for yourself

# Join Space?

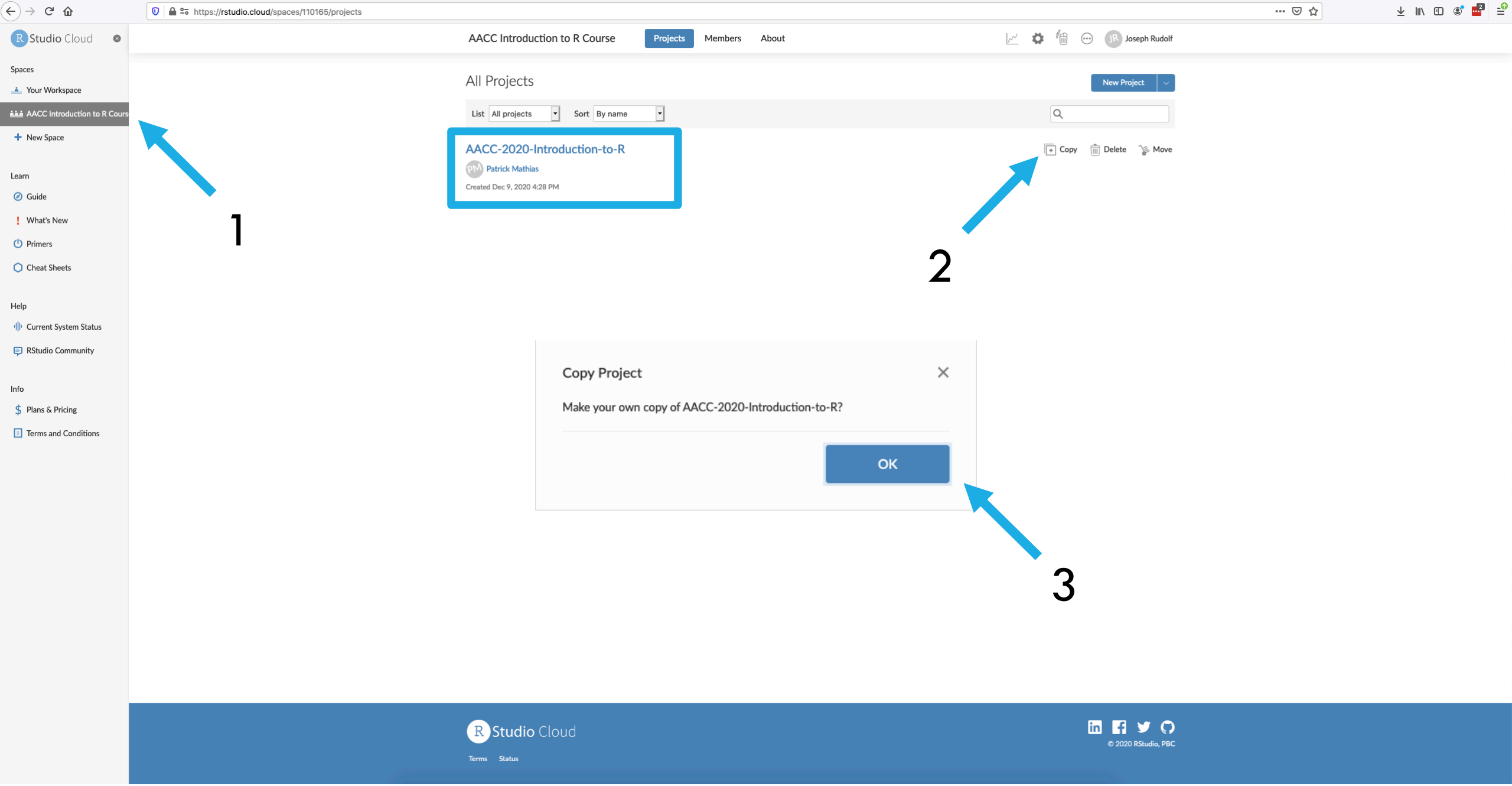
Joining a space gives you access to it and to its contents.

Once you join, admins will be able to see your email address.

Would you like to join this space?

Join Space

Cancel


https://rstudio.cloud/spaces/110165/projects
Studio Cloud
Spaces
Your Workspace
AACC Introduction to R Cours
New Space
Learn
Guide
What's New
Primers
Cheat Sheets
Help
Current System Status
RStudio Community
Info
Plans & Pricing
Terms and Conditions
AACC Introduction to R Course
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Joseph Rudolf
All Projects
New Project
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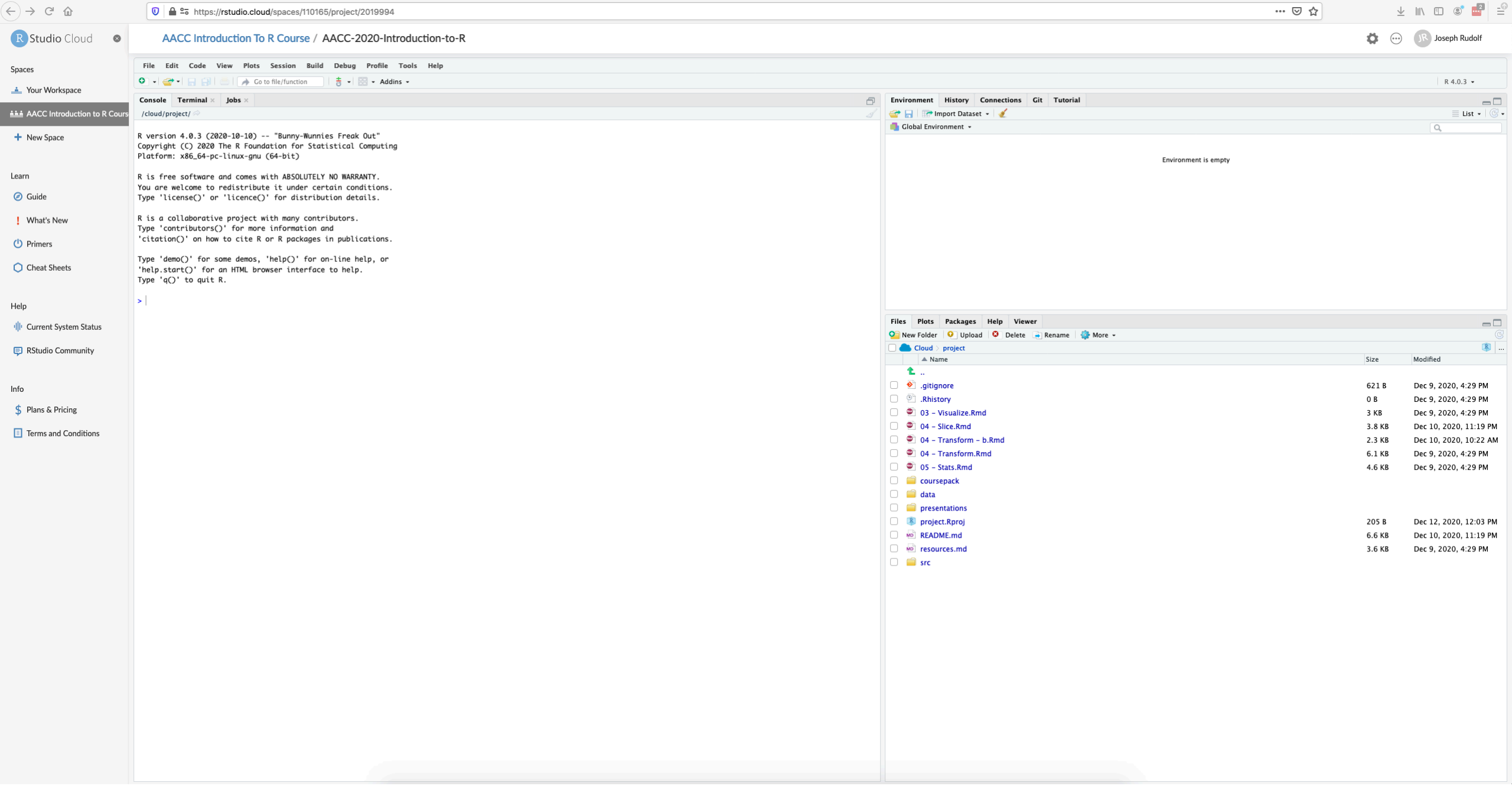
https://rstudio.cloud/spaces/110165/project/2019994
Studio Cloud
AACC Introduction To R Course / AACC-2020-Introduction-to-R
Joseph Rudolf
Spaces
Your Workspace
AACC Introduction to R Cours
New Space
Learn
Guide
What's New
Primers
Cheat Sheets
Help
Current System Status
RStudio Community
Info
Plans & Pricing
Terms and Conditions
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
R 4.0.3
Console Terminal Jobs
/cloud/project/
R version 4.0.3 (2020-10-10) -- "Bunny-Wunnies Freak Out"
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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 Git Tutorial
Import Dataset
List
Global Environment
Environment is empty
Files Plots Packages Help Viewer
New Folder
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Delete
Rename
More
Cloud
project
Name
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README.md 6.6 KB Dec 10, 2020, 11:19 PM
resources.md 3.6 KB Dec 9, 2020, 4:29 PM
src

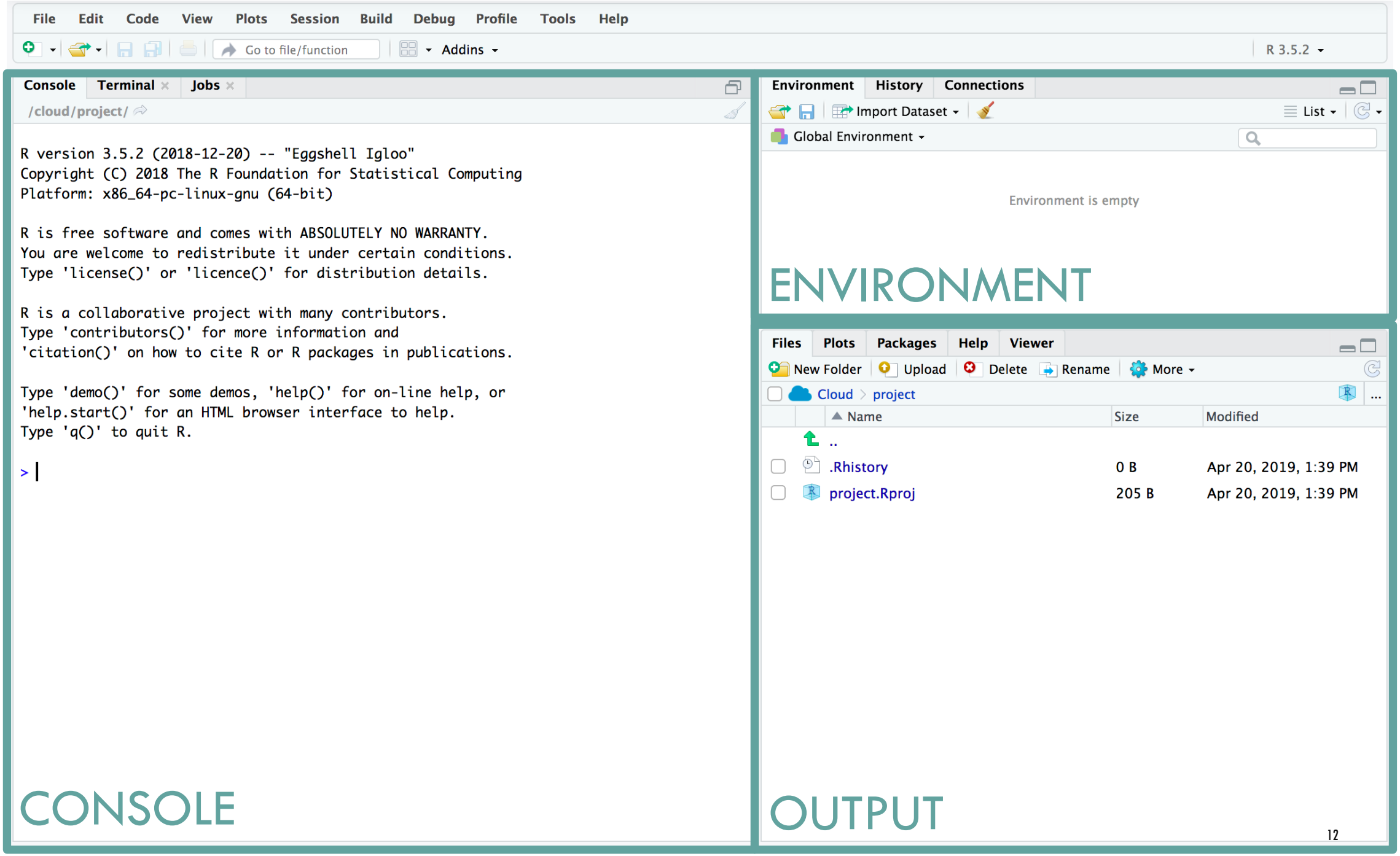
# Your Turn

Navigate to: **https://tinyurl.com/r-aacc-2020**

Enter your log in credentials

Join Space

Make a copy of the Core Exercises for yourself


File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
R 3.5.2
Console
Terminal
Jobs
/cloud/project/
R version 3.5.2 (2018-12-20) -- "Eggshell Igloo"
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Platform: x86_64-pc-linux-gnu (64-bit)
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'help.start()' for an HTML browser interface to help.
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>
CONSOLE
Environment
History
Connections
Import Dataset
List
Global Environment
Environment is empty
ENVIRONMENT
Files
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Help
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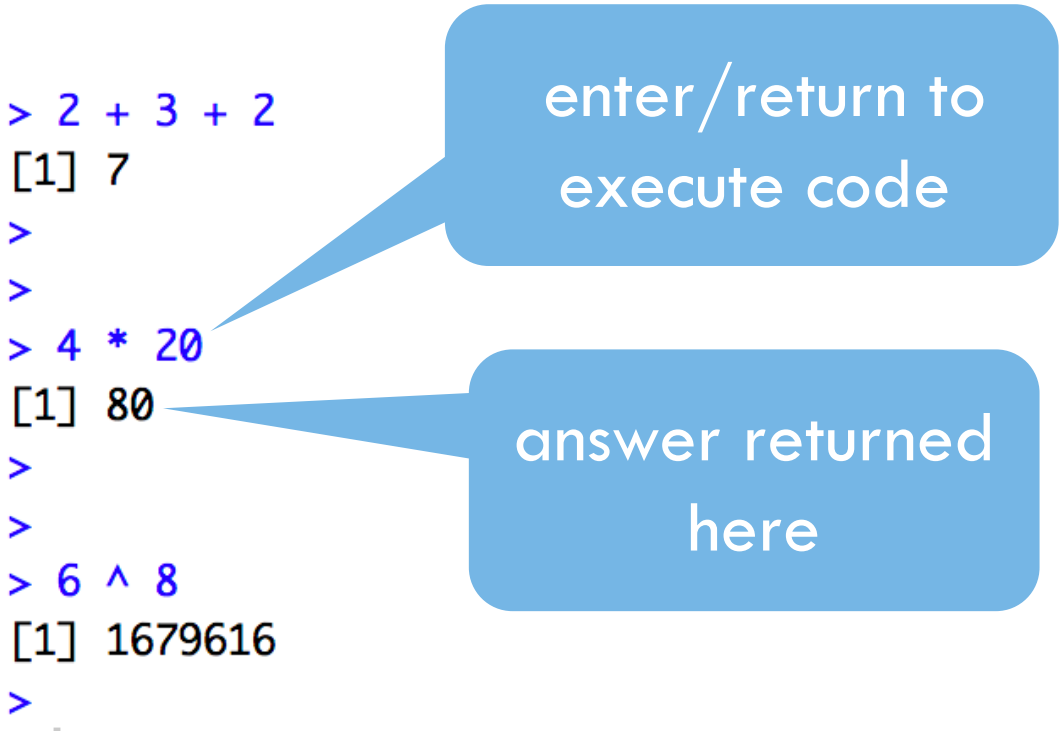
OUTPUT

# The Basics of Coding

# The Basics of Coding: Calculation

- R is a calculator!



# Your Turn 1

Place your cursor at the console and click to enter the console.

Complete the following calculation:

-Take the integer 1974

-Subtract 12

-Multiply by 29

# What did you get?

- A four digit number?  A five digit number?

```
> 1974 - 12 * 29
[1] 1626
>
>
> (1974 - 12) * 29
[1] 56898
```

- Order of operations matters!

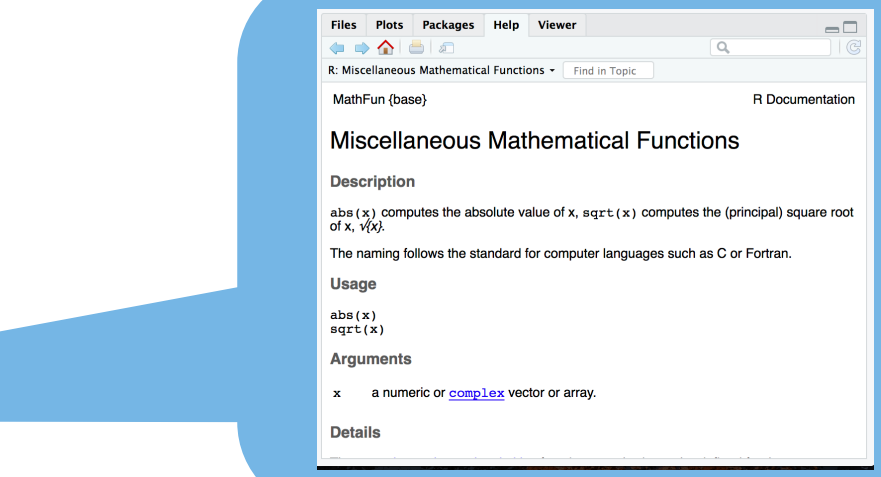
# The Basics of Coding: Functions

- Code that extends our reach beyond the basic operators

```
> abs(-77)
[1] 77
>
```

- What if I don't know what a function does?

```
>
> ?abs()
>
```



# When you need more help

- The Internet (Stack Overflow: https://stackoverflow.com/)
- Work Aids (RStudio Cheat Sheets: https://www.rstudio.com/resources/cheatsheets/)
- A Good Book (R for Data Science: http://r4ds.had.co.nz/)

# Putting Functions to Work

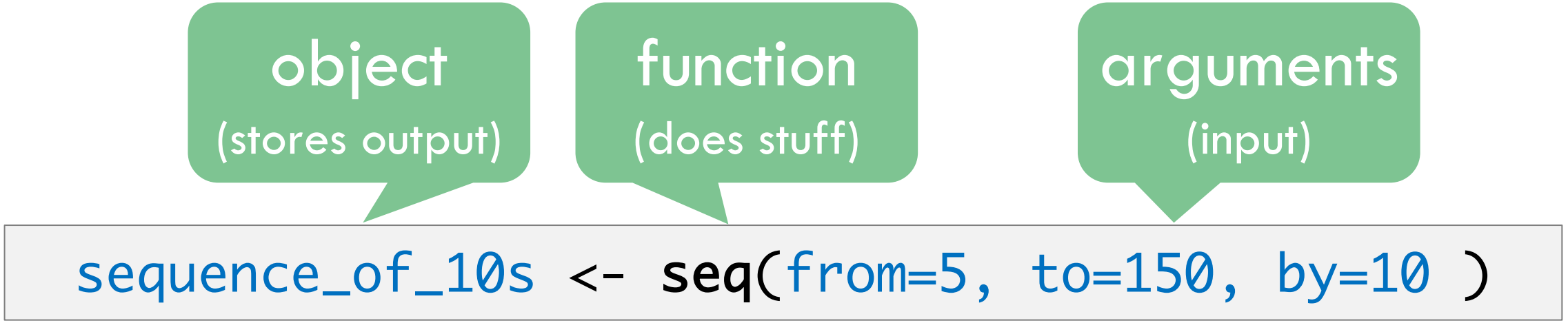
- We can use functions to do more than simple math, we can make things!

- We can create a series of integers (a vector) using the seq() function

```
>
> seq(from=5, to=150, by=10)
 [1]   5  15  25  35  45  55  65  75  85  95 105 115 125 135 145
```

# The Basics of Coding: Objects

- Objects are the container for your output



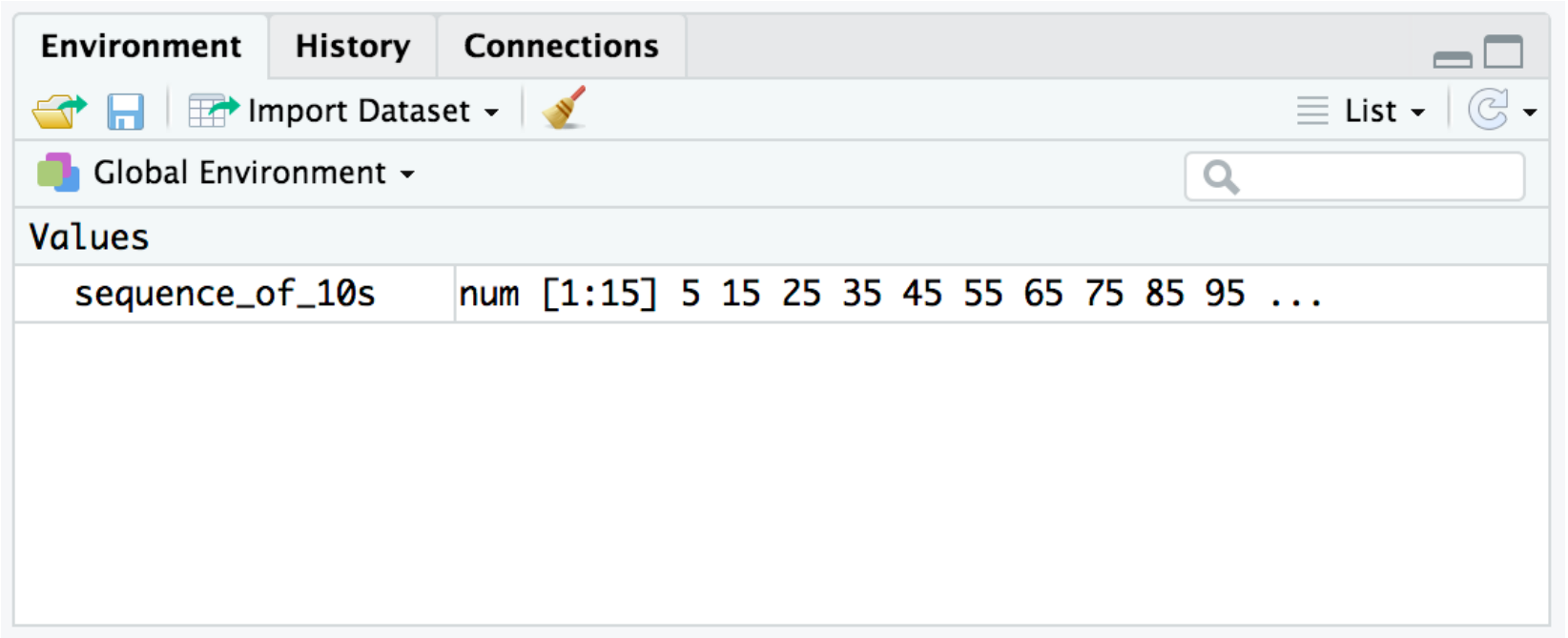
# Checking the Contents of an Object

- Entering the object name at the console allows us to output the contents of an object.

```
>
> sequence_of_10s
 [1]   5  15  25  35  45  55  65  75  85  95 105 115 125 135 145
```

# Checking the contents of an object

- The environment tab shows us the objects we have created.



# Bending objects to your will

- Once we have created an object we can start to interact with it.
- This includes passing our objects to other functions… Whoa!

```
>
> min(sequence_of_10s)
[1] 5
>
> max(sequence_of_10s)
[1] 145
>
```

# Your Turn 2

Generate a sequence, store it to an object, and ply your object

Type the following code to create a sequence from 0 to 500 in increments of 25 called sequence_of_25s:

```
sequence_of_25s <- seq(from=0, to=500, by=25)
```

Calculate the median value of this series using the `median()` function

# The Basics of Coding: Packages

- A package is a collection of functions.


- Packages extend the capabilities of the base R programming language.

- The **tidyverse** includes functions for reading data into the R environment, cleaning and manipulating data, and plotting our results.

# Installing and Loading Packages

- Installing a package


```
install.packages("tidyverse")
```

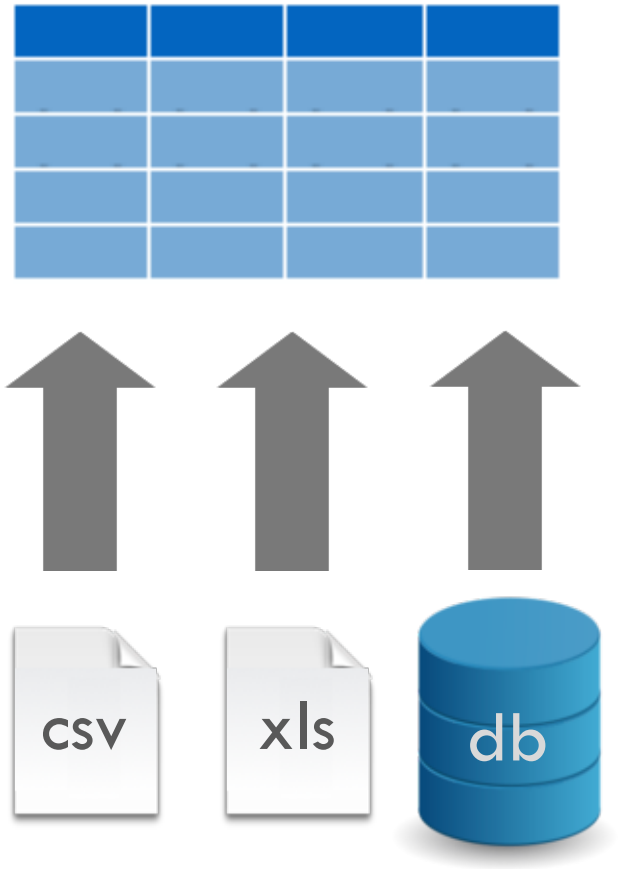
- Loading into your environment

```
library(tidyverse)
```

# Importing Data and Working with Dataframes (aka Useful Data)

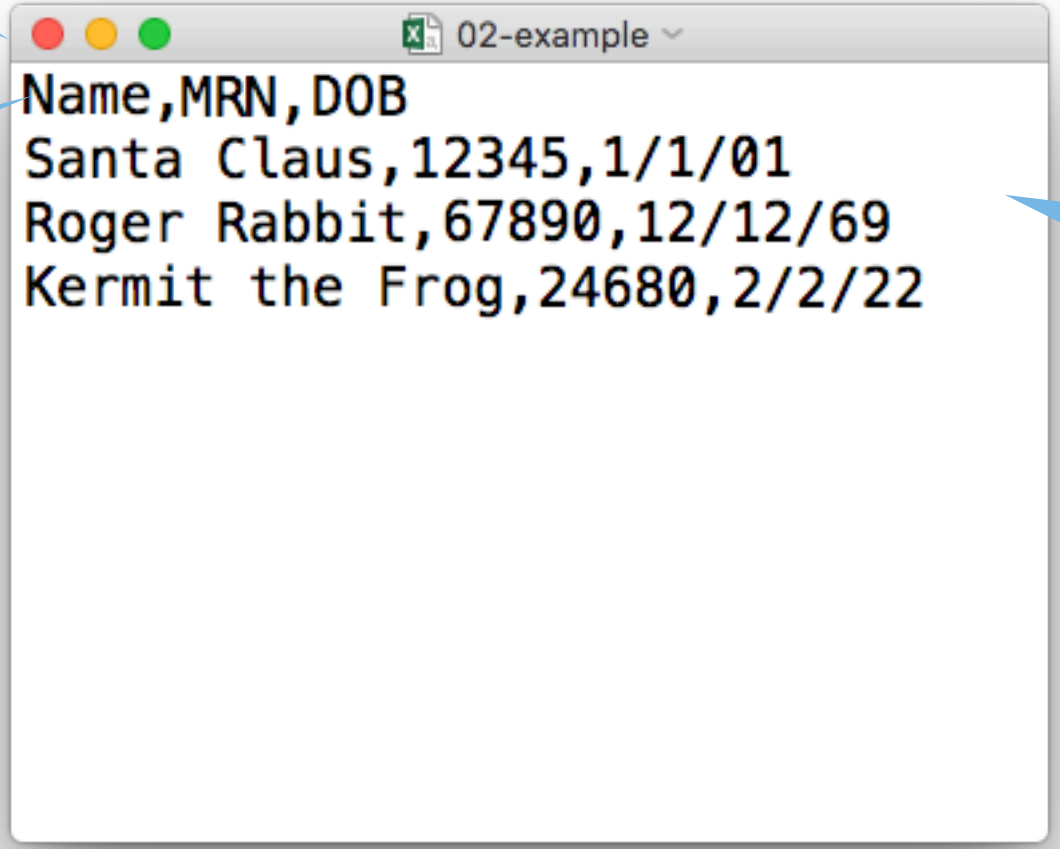
# Dataframes: Beyond the Vector

- Dataframe is the term for a table
- Dataframes are composed:
  Columns (Variables)
  Rows (Observations)
- Dataframes are objects and can be acted on like other objectsç



plain text ("flat") file

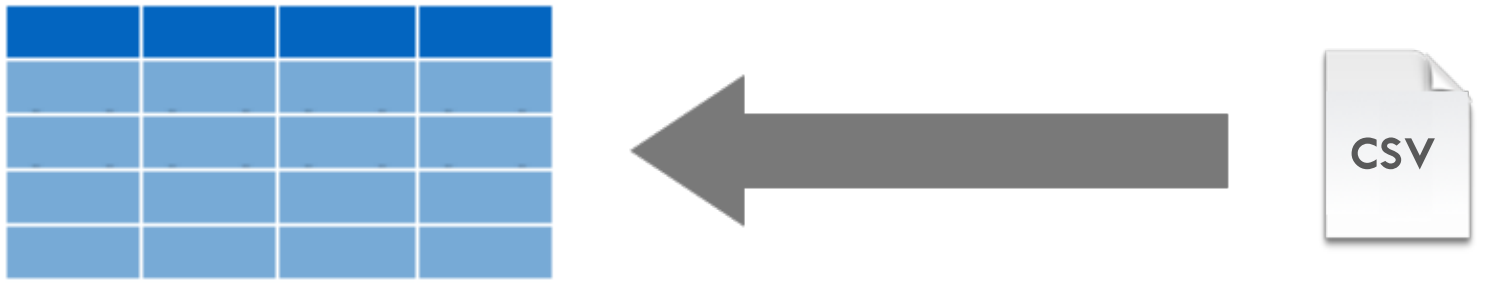
header row




rectangular structure

# Loading Data to Create a Dataframe

```
data_frame <- read_csv("file_name")
```



# Your Turn 3

Configure environment and load the Covid Testing CSV:

Load the tidyverse library using `library(tidyverse)`

Use the **`read_csv()`** function to load the data

-File_name argument: `"data/covid_testing.csv"`

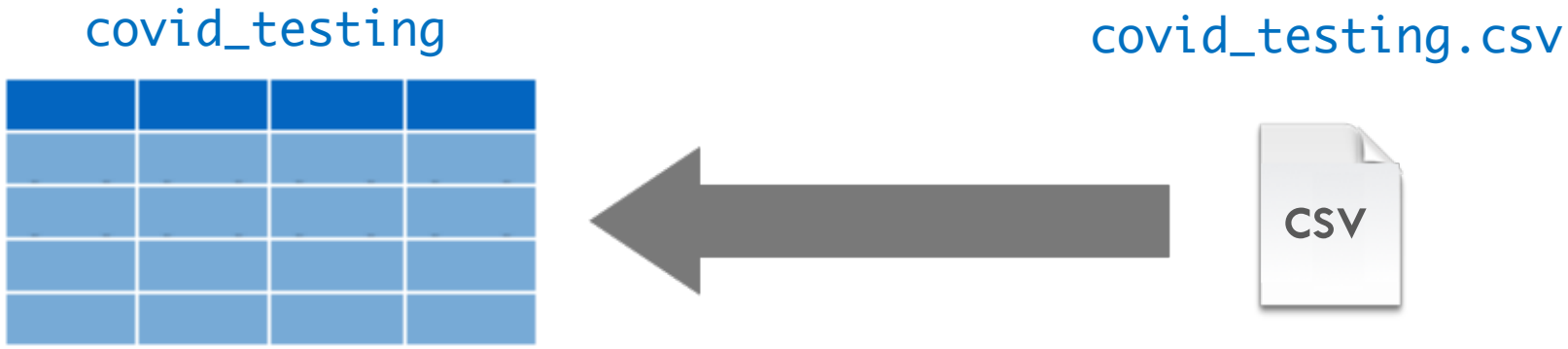
-Object name: `covid_testing`

# read_csv()

data frame to read data into

name of CSV file

```
covid_testing <- read_csv("data/covid_testing.csv")
```



# What's in a name?

- Capitalization matters

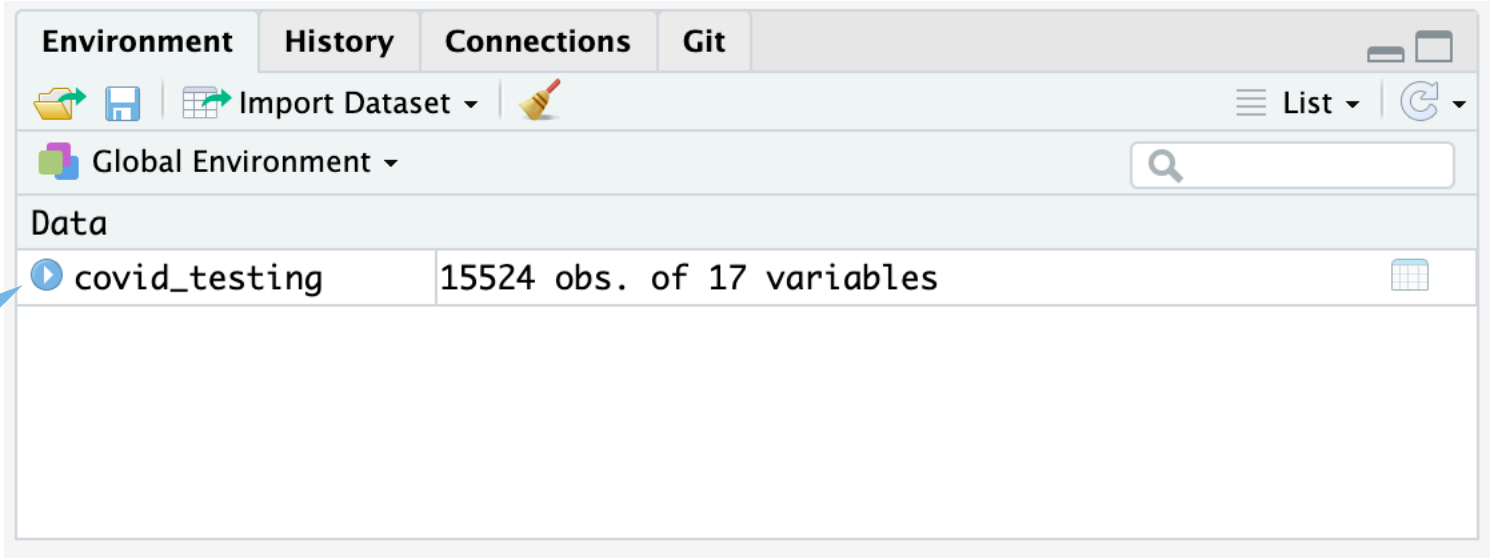
`covid_testing` ≠ `Covid_testing` ≠ `COVID_TESTING`

- Strive for names that are concise and meaningful (not easy!)

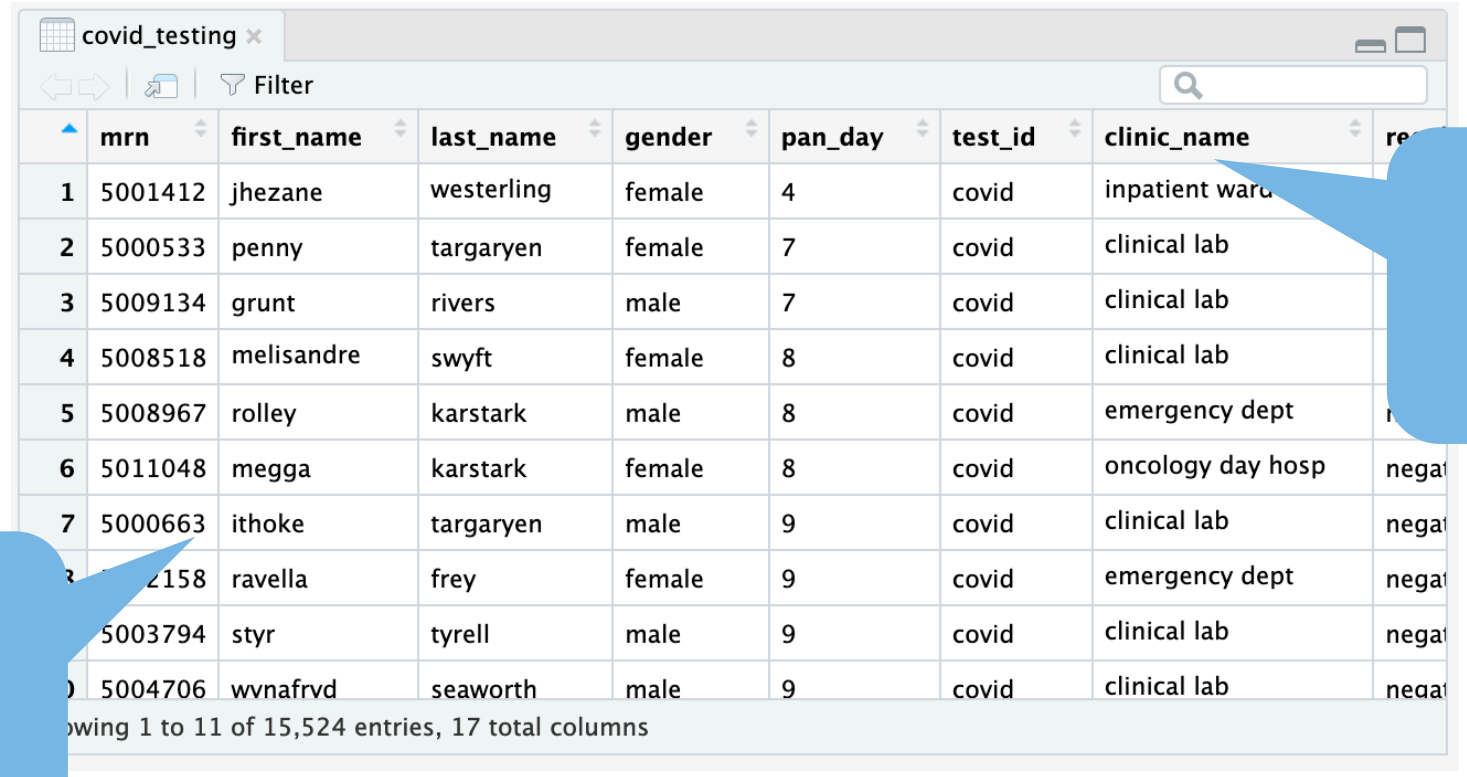
| Bad | Still not great | Good |
| --- | --- | --- |
| `p` | `name` | `patient_name` |

# Viewing the Contents of a Dataframe

single click to explore the data



# Viewing the Contents of a Dataframe




17 Attributes (Columns)

15,524 Observations (Rows)

# Working with Dataframes at the Console

- The head() function is helpful for displaying a snippet of your dataframe

```
head(object_name, n=number of rows to view)
```

Sample of Data in Your Object

Console | Terminal | Jobs

/cloud/project/

```
> head(covid_testing, n=5)
# A tibble: 5 x 17
     mrn first_name last_name gender pan_day test_id clinic_name result demo_group
   <dbl> <chr>      <chr>     <chr>    <dbl> <chr>   <chr>       <chr>  <chr>
1 5.00e6 jhezane    westerli… female       4 covid   inpatient … negat… patient
2 5.00e6 penny      targaryen female       7 covid   clinical l… negat… patient
3 5.01e6 grunt      rivers    male         7 covid   clinical l… negat… patient
4 5.01e6 melisandre swyft     female       8 covid   clinical l… negat… patient
5 5.01e6 rolley     karstark  male         8 covid   emergency … negat… patient
# … with 8 more variables: age <dbl>, drive_thru_ind <dbl>, ct_value <dbl>,
#   orderset <dbl>, payor_group <chr>, patient_class <chr>, col_rec_tat <dbl>,
#   rec_ver_tat <dbl>
>
```

# Your Turn 4

Understanding Object Contents

Use the `tail()` function to view the **last 10 rows** of our object `covid_testing`.

-What is the ratio of female to male patients in this subset of data?

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