Learn R!

Complete Beginner’s Workshop

Sat April 14

1 pm | Room 121 LSK Building
UBC Campus

R
LADIES
Vancouver

ECOSCOPE
routing the microcosmos

R
LADIES
Vancouver

A local chapter of R-Ladies, a global organization promoting gender diversity in the R community.

🐦 @RLadiesVan

Events meetup/R-Ladies-Vancouver

✉ vancouver@rladies.org

R-Ladies mission

More women/non-binary
- coders
- developers
- speakers
- leaders

More awesome people developing R packages and being part of the R community.

Hello!

Your chapter’s current organizers

Anna

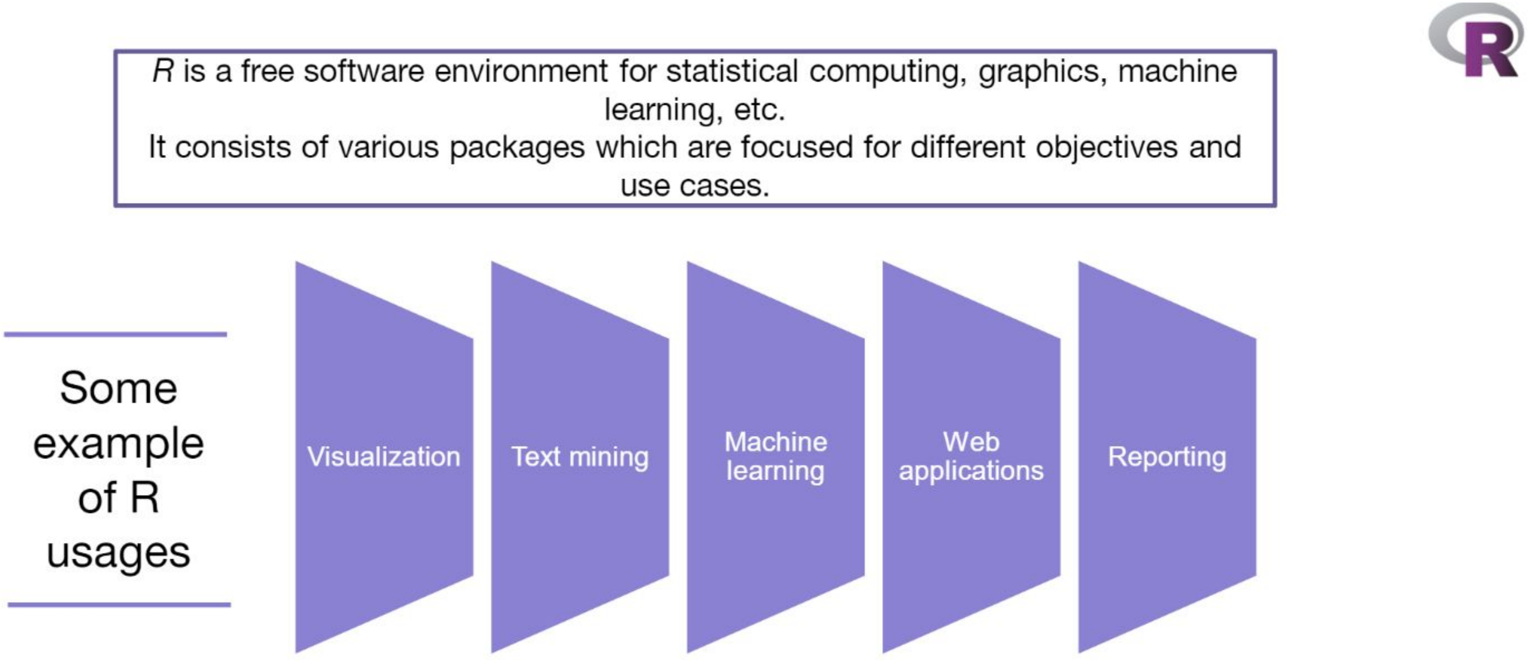
Özüm

Marion

What is R and RStudio?

R has diverse application

It is one of the most popular languages in Data science



R is a free software environment for statistical computing, graphics, machine learning, etc.
It consists of various packages which are focused for different objectives and use cases.

Some example of R usages

Visualization

Text mining

Machine learning

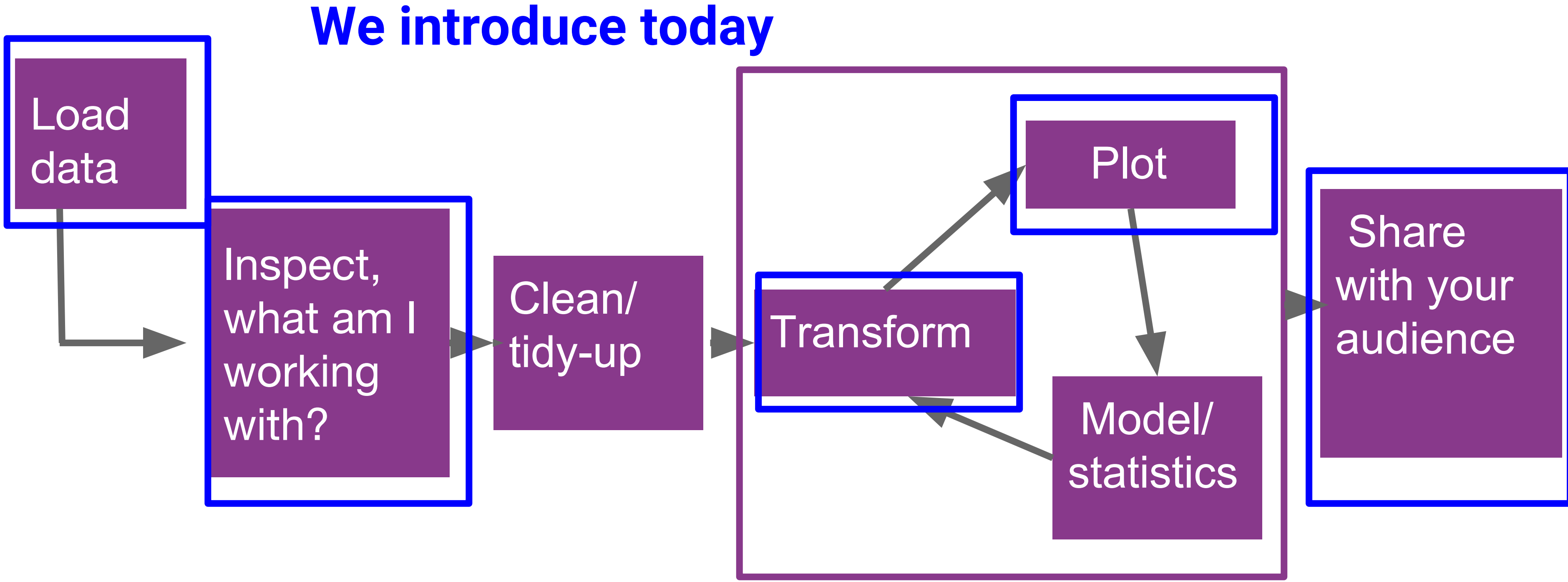
Web applications

Reporting

From R-Ladies Milan

Ok, now let’s learn some R!

Life stages of data analysis



Adapted from R for Data Science by Hadley Wickham
http://r4ds.had.co.nz/introduction.html

Today's workshop

1. RStudio orientation
2. Basics of coding in R
3. Working with functions and packages
4. Loading and inspecting the Titanic dataset
5. Basics of DATA WRANGLING with the DPLYR package
6. Basics of DATA PLOTTING with the GGPLOT2 package

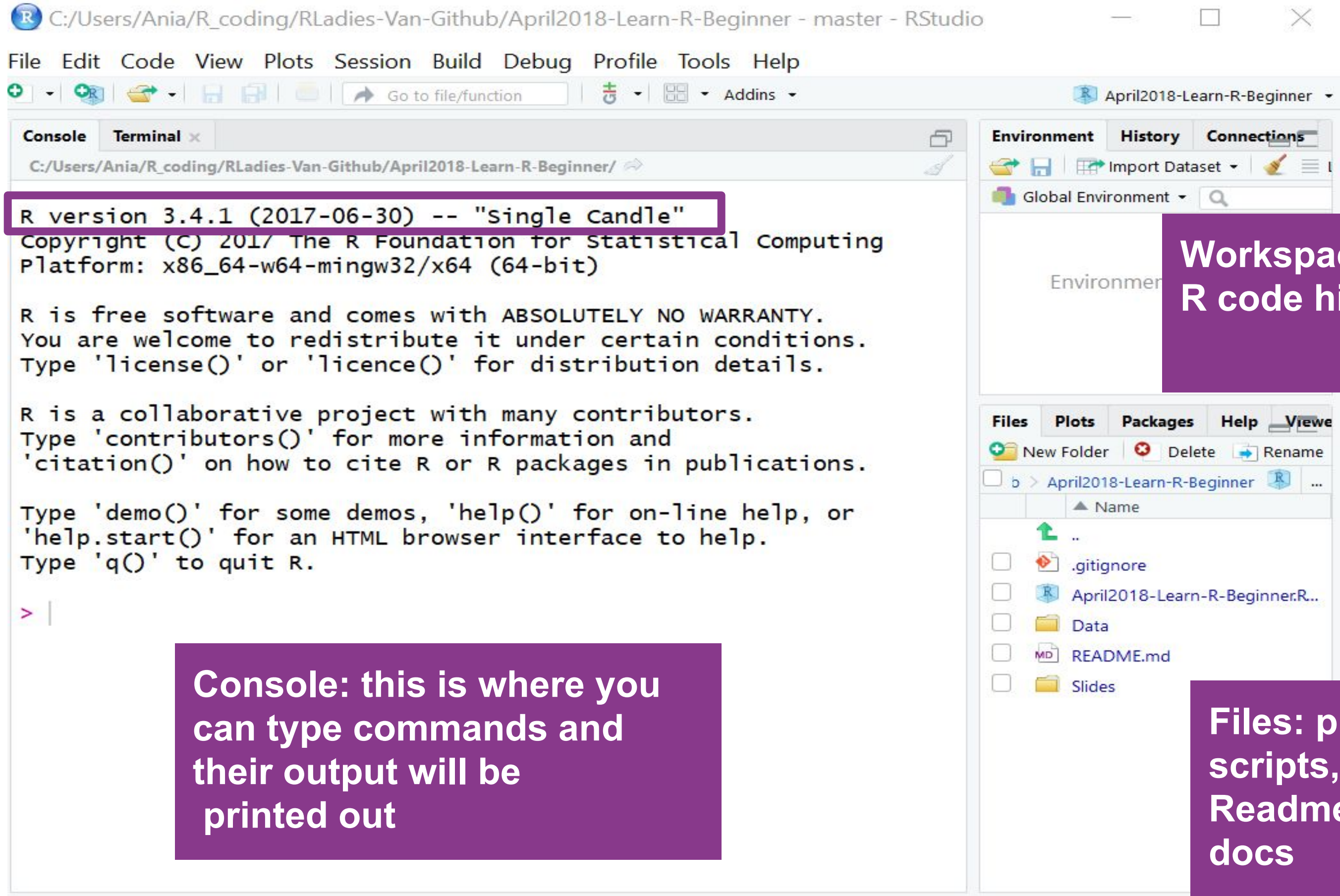
Workshop format

- Say hello to your neighbour!
- After each concept, we all do a challenge together

1.

RStudio orientation

RStudio launched



C:/Users/Ania/R_coding/RLadies-Van-Github/April2018-Learn-R-Beginner - master - RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
April2018-Learn-R-Beginner
Console
Terminal
C:/Users/Ania/R_coding/RLadies-Van-Github/April2018-Learn-R-Beginner/
Environment
History
Connections
Import Dataset
Global Environment
Environmen
Files
Plots
Packages
Help
Viewe
New Folder
Delete
Rename
April2018-Learn-R-Beginner
Name
..
.gitignore
April2018-Learn-R-Beginner.R...
Data
README.md
Slides

```
R version 3.4.1 (2017-06-30) -- "Single Candle"
Copyright (C) 2017 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (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.

>
```

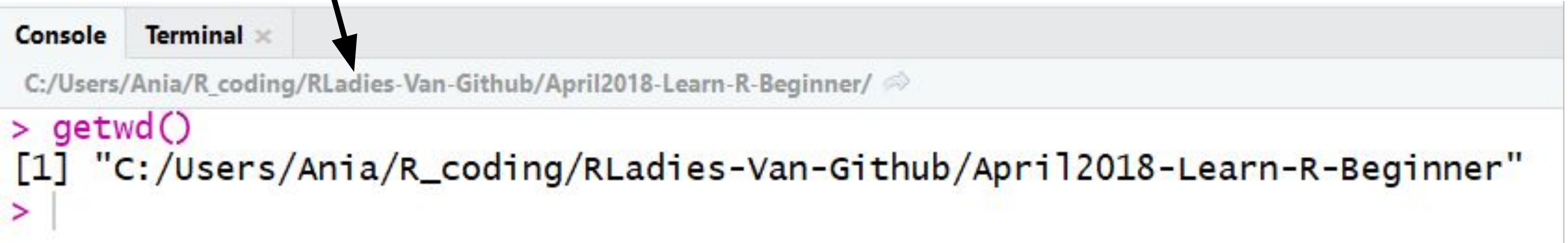
Workspace
R code history

Console: this is where you can type commands and their output will be printed out

Files: plots, scripts, folders, Readme files, docs

Where is my R work going to exist?
What is a working directory?

- A `location` on your computer
- Below is a `path` to where R will put anything I generate with my R script.
- You can find out where that is for you by typing `getwd()` `in the console` or noting the path in the console bar



C:/Users/Ania/R_coding/RLadies-Van-Github/April2018-Learn-R-Beginner/

```
> getwd()
[1] "C:/Users/Ania/R_coding/RLadies-Van-Github/April2018-Learn-R-Beginner"
> 
```

Best to keep everything related to your analysis in the same **LOCATION**

How? with R Projects!

👍

great tip

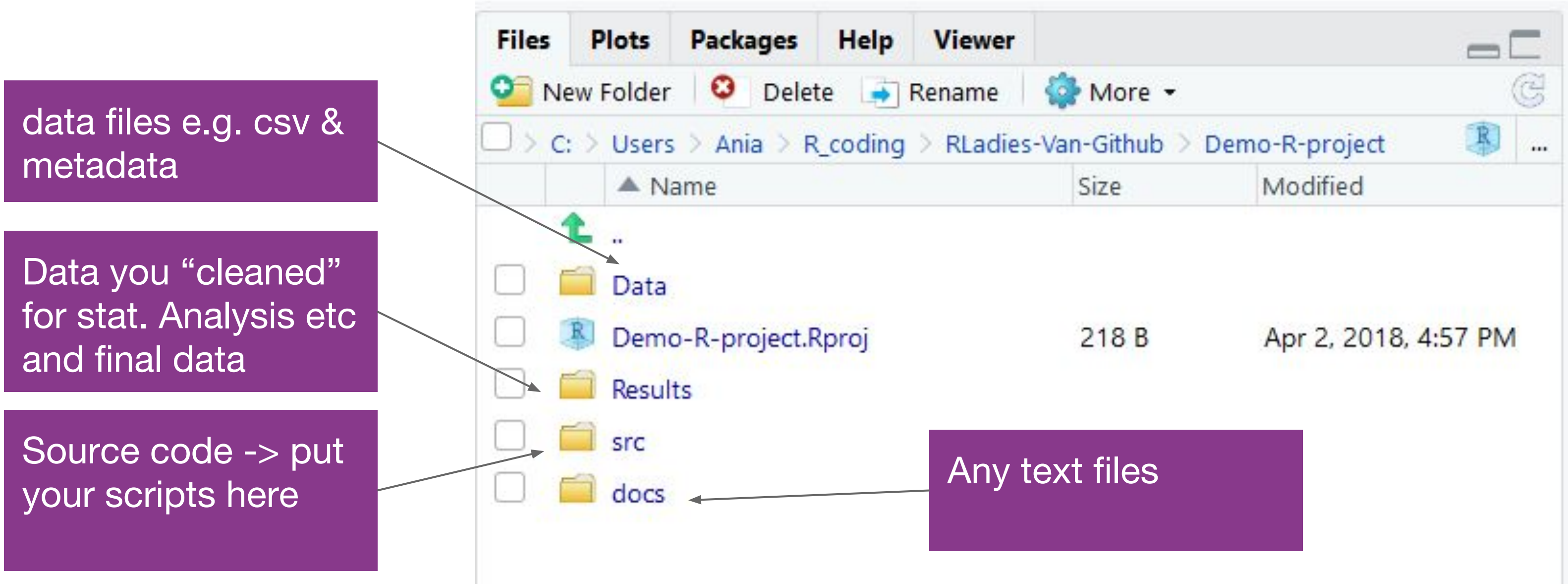
Steps

1. Decide where on your computer you want your future R work to live (somewhere sensible)

2. File> New project>New working>R project

Best to keep everything in that **LOCATION** organized

How?



C: > Users > Ania > R_coding > RLadies-Van-Github > Demo-R-project

Name	Size	Modified
..		
Data		
Demo-R-project.Rproj	218 B	Apr 2, 2018, 4:57 PM
Results		
src		
docs		

data files e.g. csv & metadata

Data you “cleaned” for stat. Analysis etc and final data

Source code -> put your scripts here

Any text files

More on this from
https://swcarpentry.github.io/r-novice-gapminder/02-project-intro/

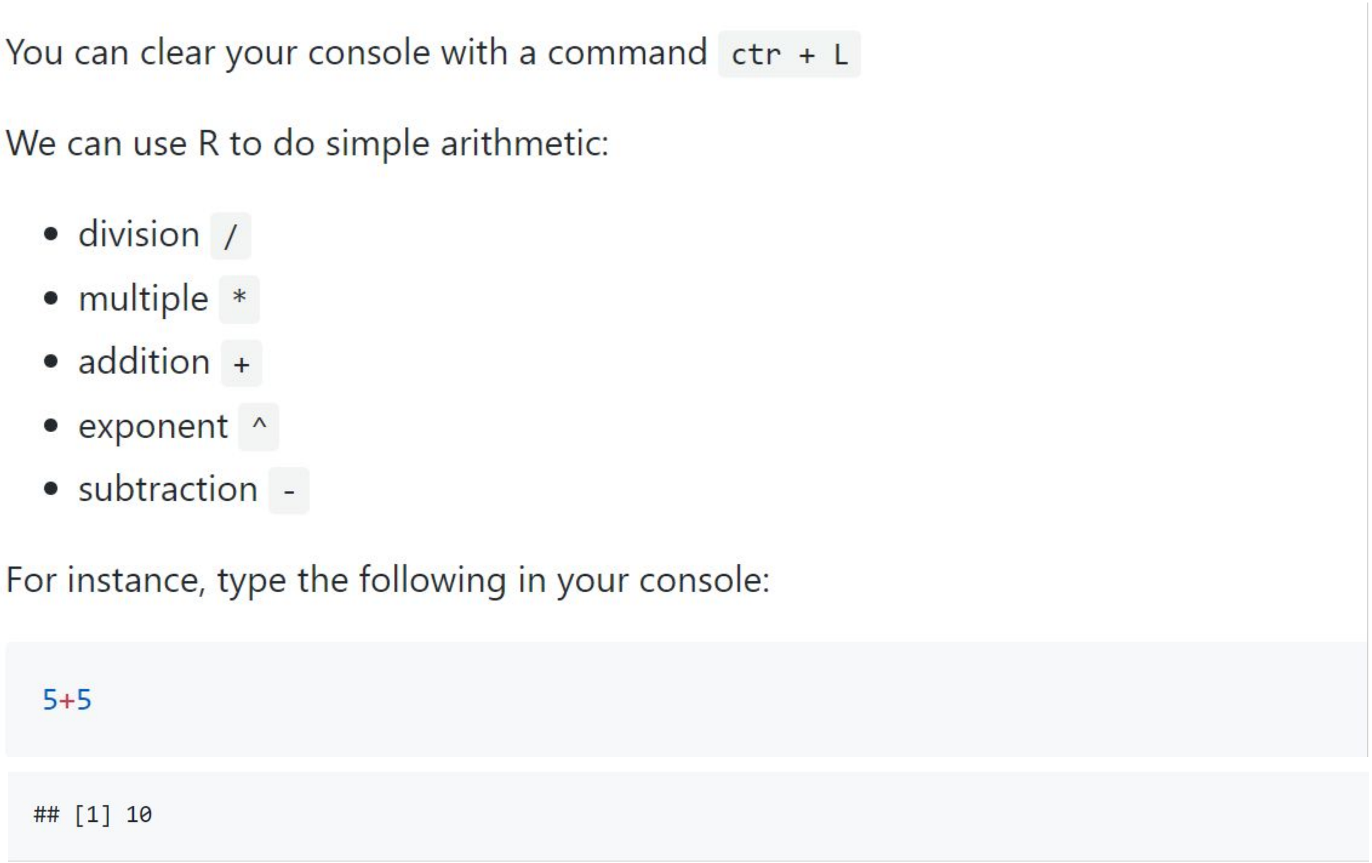
This is a good place to start, you might want to adapt to suit your needs.

Challenge 1!

1. Create an **Rproject** called “R-beginner-workshop". Click File>New Project>New directory>Empty project
2. Create a folder called "**data**"
3. Put the **titanic.csv** into the folder data
4. Create a folder called "scr”

2.
R coding basics

Calculating with R



You can clear your console with a command `ctr + L`

We can use R to do simple arithmetic:

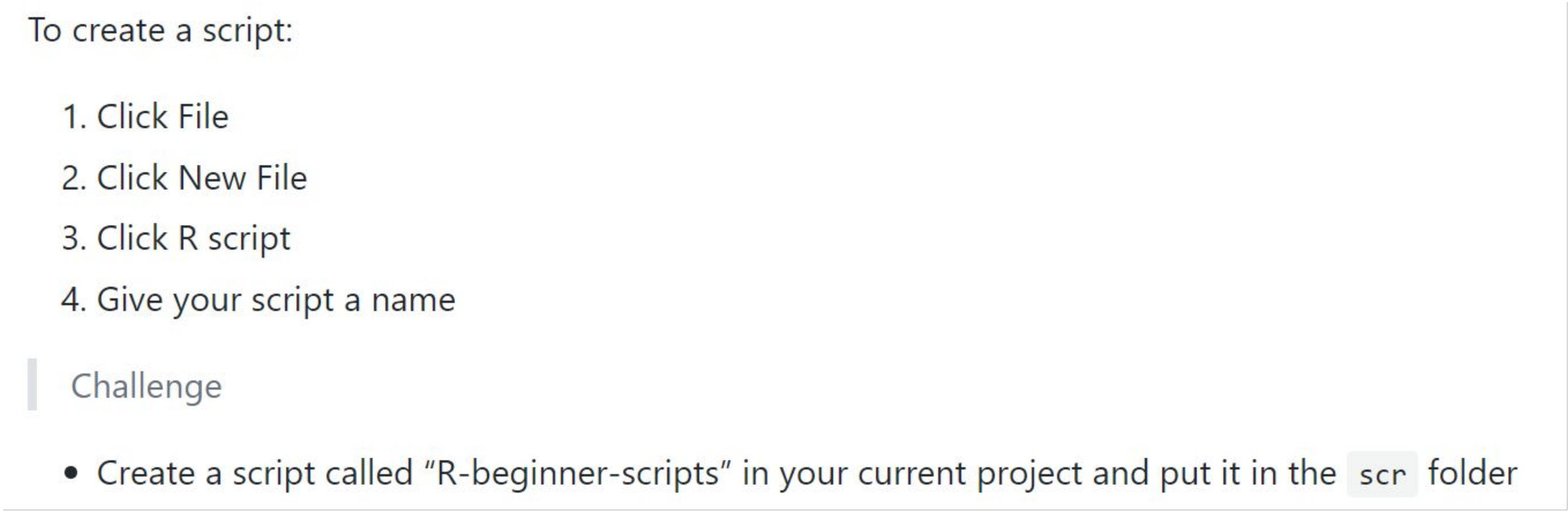
- division `/`
- multiple `*`
- addition `+`
- exponent `^`
- subtraction `-`

For instance, type the following in your console:

```
5+5
```

```
## [1] 10
```

Building a code



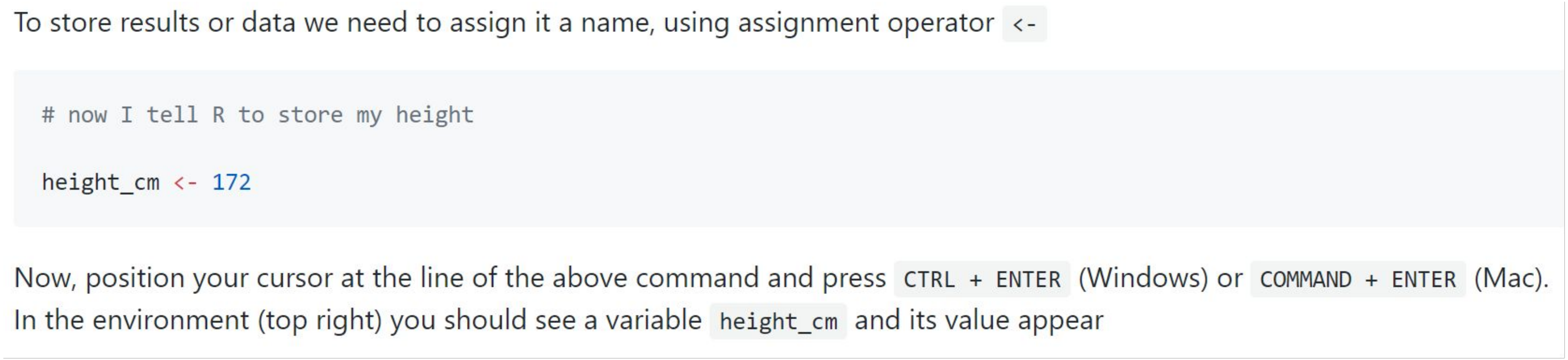
To create a script:

1. Click File
2. Click New File
3. Click R script
4. Give your script a name

> Challenge

- Create a script called “R-beginner-scripts” in your current project and put it in the `scr` folder

Creating objects in R workspace



To store results or data we need to assign it a name, using assignment operator `<-`

```
# now I tell R to store my height

height_cm <- 172
```

Now, position your cursor at the line of the above command and press `CTRL + ENTER` (Windows) or `COMMAND + ENTER` (Mac). In the environment (top right) you should see a variable `height_cm` and its value appear

#rcatladies

Challenge!

1. Clear your workspace

2. Create a variable called **mass_kg** with a value of **50**

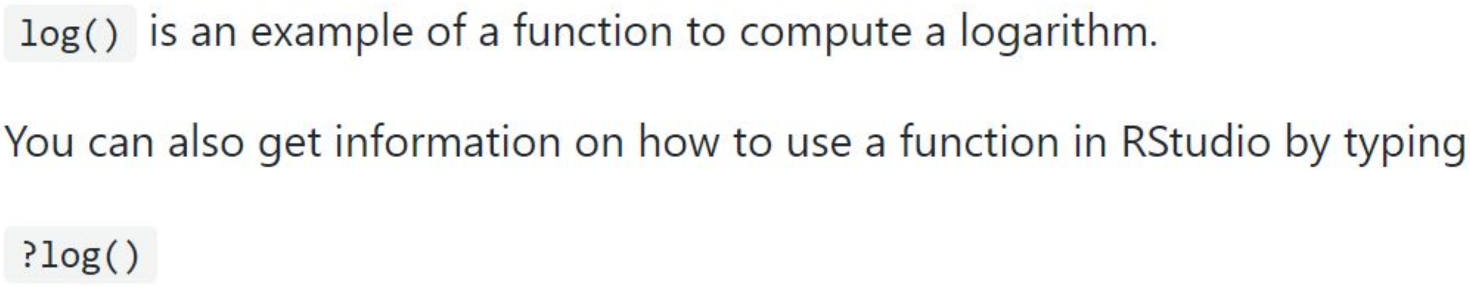
3. Convert mass_kg to mass in **pounds** (multiply by 2.2) and store the answer in **mass_lbs**

3.

Functions and Packages

What are functions?

- Fundamental building blocks of R
- Built-in functions use input arguments to return a value or an output
- You can build your own functions for your specific needs!



`log()` is an example of a function to compute a logarithm.

You can also get information on how to use a function in RStudio by typing

```
?log()
```

So is **getwd()** we used earlier!

What are packages?

- Fundamental units of reproducible R code; include R functions, the documentation that describes how to use them and sample data (from http://r-pkgs.had.co.nz)

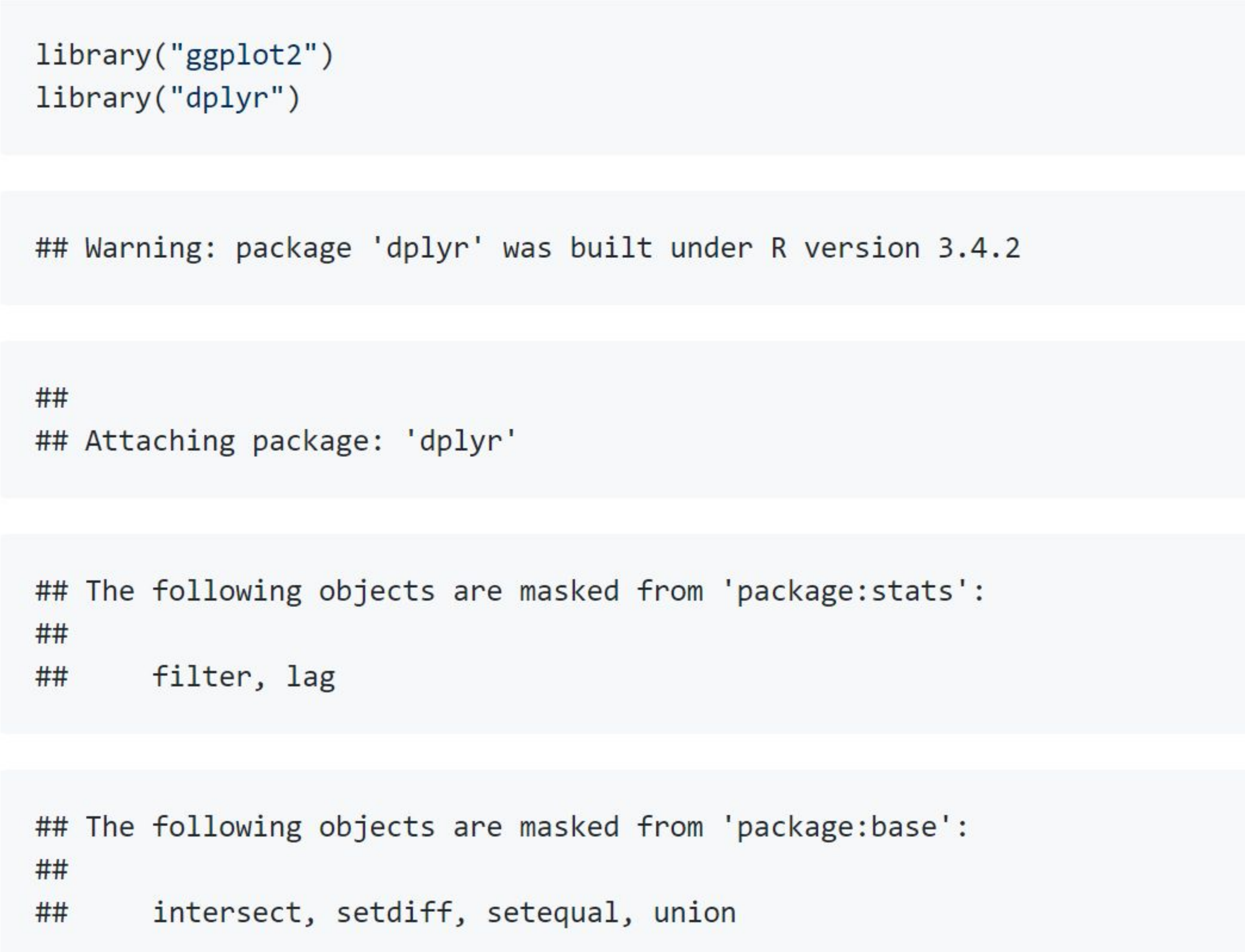
- Need to be **installed** first (once only). There are 2 ways: 1) **install.packages(“package-name”)** or from RStudio (right-bottom corner)

- Need to be loaded for every instance of R session using **library(package-name)** [note no “” this time]

Challenge !

1. Install packages **dplyr** and **ggplot2** using **install.packages()**

2. Load both packages (top of your script)



```
library("ggplot2")
library("dplyr")
```

```
## Warning: package 'dplyr' was built under R version 3.4.2
```

```
##
## Attaching package: 'dplyr'
```

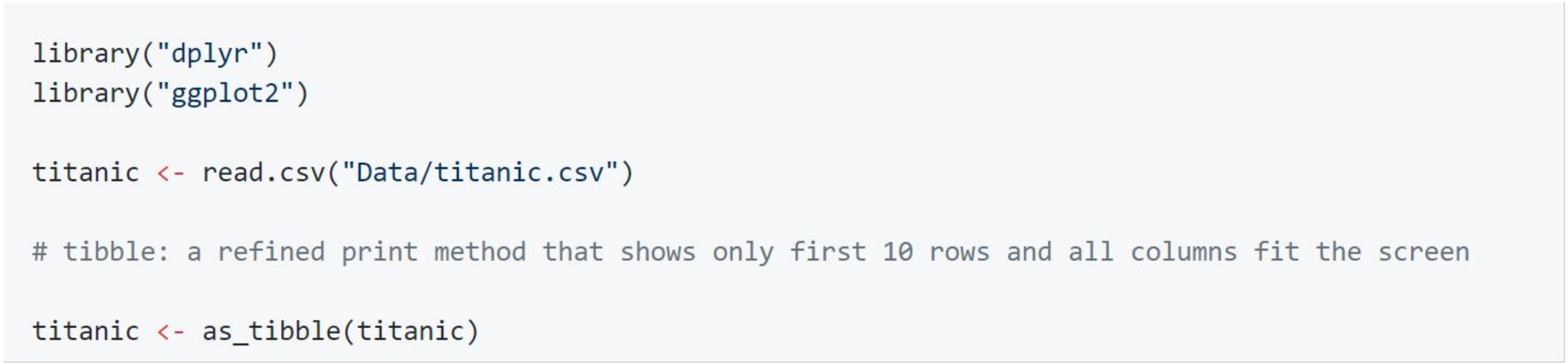
```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

4.

Loading + inspecting titanic.csv

Loading data from csv into R



```
library("dplyr")
library("ggplot2")

titanic <- read.csv("Data/titanic.csv")

# tibble: a refined print method that shows only first 10 rows and all columns fit the screen

titanic <- as_tibble(titanic)
```

The above read.csv() function creates an object in the R environment that has:

- variables of a data set as columns
- observations as rows
- Rectangular

DATAFRAME
TIBBLE

Inspecting a dataframe

- `str()`
- `glimpse()`
- `head()`
- `nrow()`
- `dim()`
- `names()`
- `levels(dataframe$variable)`

Challenge![together]

Inspect the titanic dataset using functions

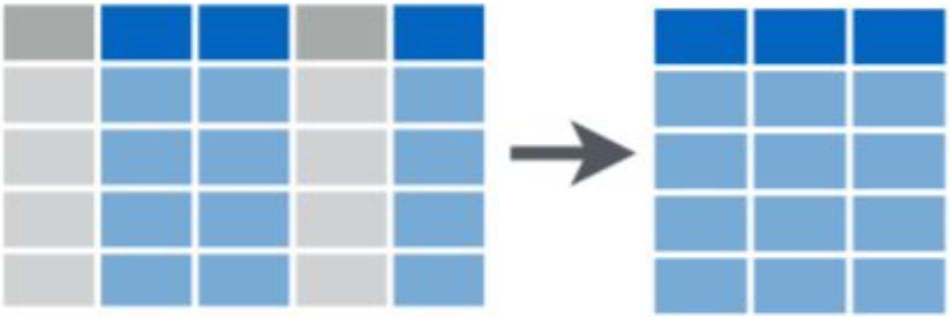
- How many observations and variables does this dataset have?

- What categories can be found in variable **Embarked**? Hint! Use levels()

5. Dplyr basics

https://dplyr.tidyverse.org/

Picking variables (columns) with `select()`



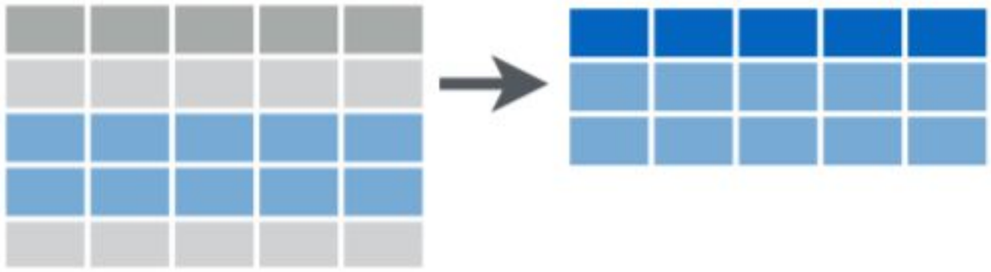
#rcatladies

Challenge time !

select()

1. Create a subset of titanic dataframe called **passanger_info** containing **Name,Age,Sex**

Subsetting observations (rows) with `filter()`



Challenge time !

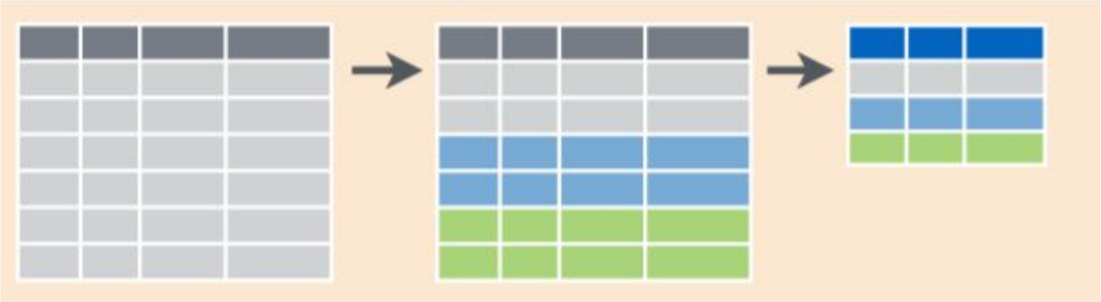
`filter()`

Create a new object called '**males**' containing only male passengers and **only the columns Age, Sex, Name and Fare.** What dimensions does your object have?

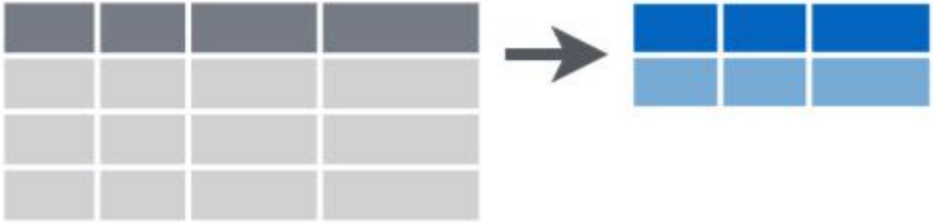
#rcatladies

Summarizing data

group_by()



summarize()



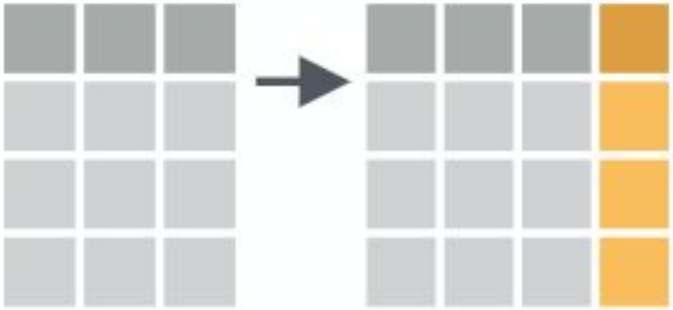
#rcatladies

Challenge time !

`group_by() & summarize()`

1. Calculate **mean, stdev and number** of observations for variables **Sex** in conjunction with **Passanger class**. Hint!: follow the example we just did.
2. Calculate the **average Survived value per Pclass and Sex.** Which combination of Pclass and Sex had the highest Survived value and which combination had the lowest?

Create new variables with `mutate()`



#rcatladies

Challenge time !

mutate()

-> Calculate the **average Survived** value for a group of 20 randomly selected females from each Pclass group.

-> Then **arrange** the classes in descending order.

Hint: Use the dplyr functions arrange() and sample_n(), they have similar syntax to other dplyr functions. Look at the help!

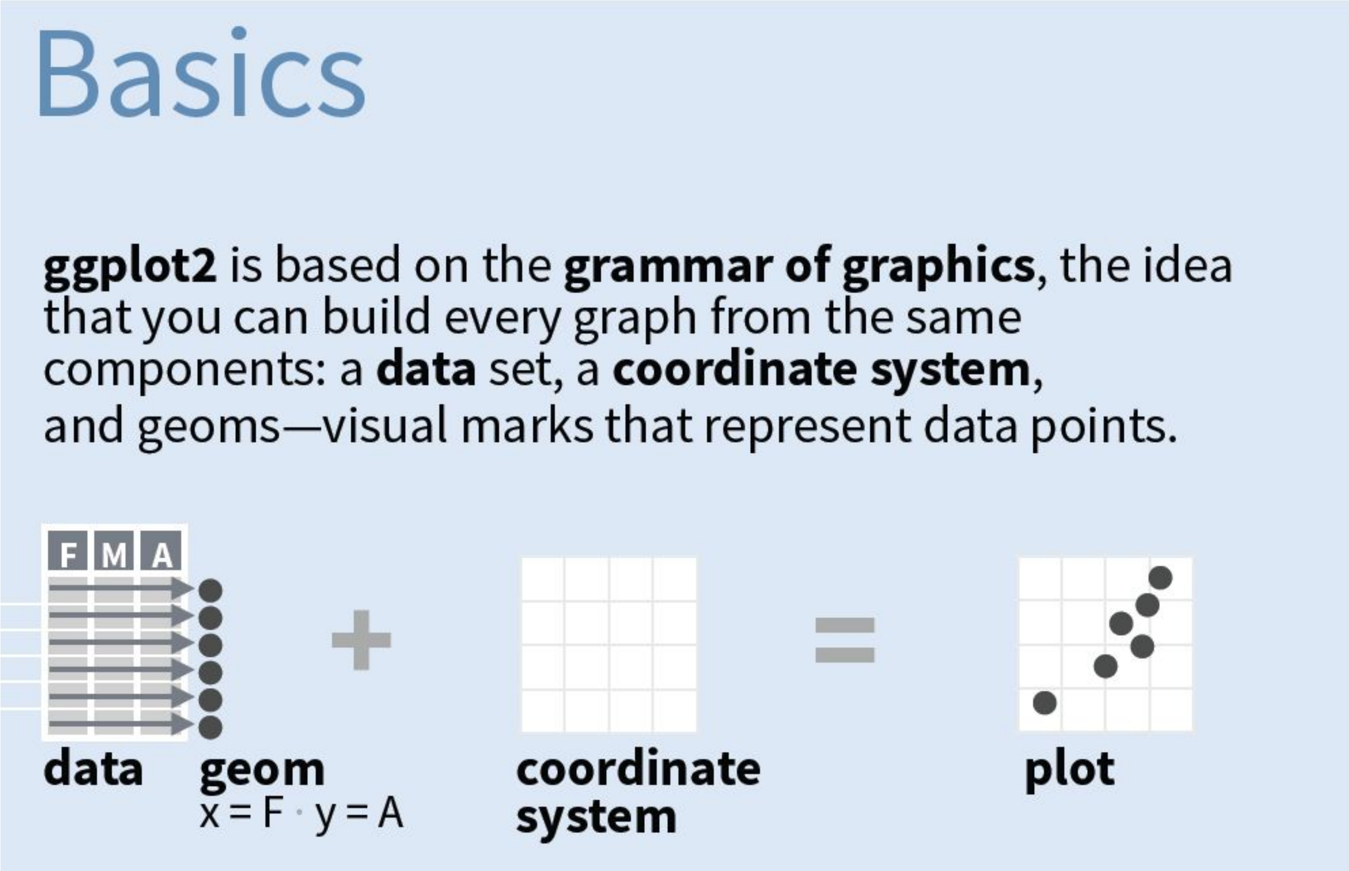
6. Ggplot2 basics

GGPLOT2 package

Implements the grammar of graphics, a system for building graphs:

- **mapping** of data
- to **aesthetic** attributes (color, size, xy-position)
- using **geometric objects** (points, lines, bars)
- with data being statistically transformed (summarised, log-transformed)
- and mapped onto a specific facet and coordinate system

From Mine Cetinkaya-Rundel
(http://rpubs.com/minebocek/117428)

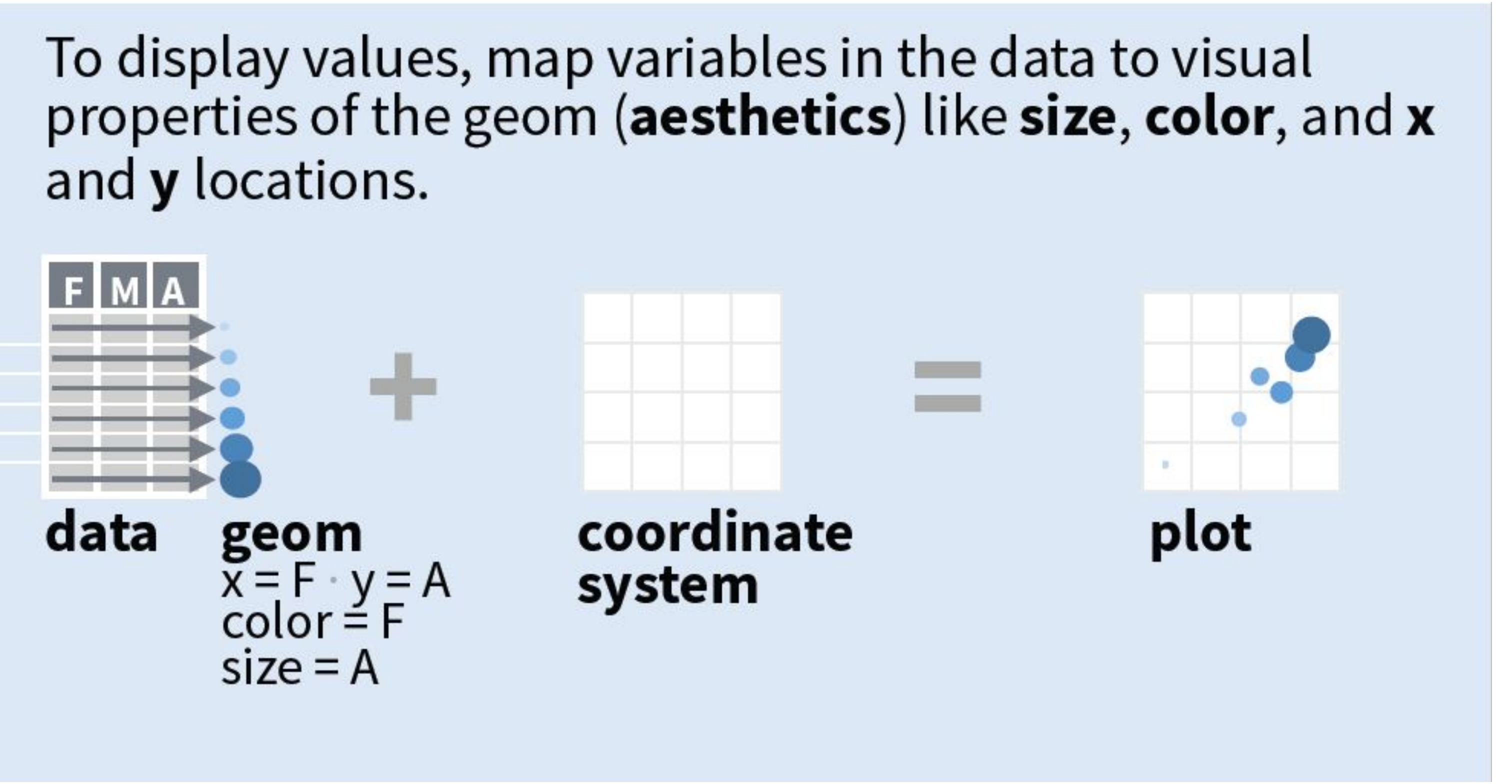


Basics

ggplot2 is based on the **grammar of graphics**, the idea that you can build every graph from the same components: a **data** set, a **coordinate system**, and geoms—visual marks that represent data points.

From ggplot2 cheatsheet:https://www.rstudio.com/resources/cheatsheets/

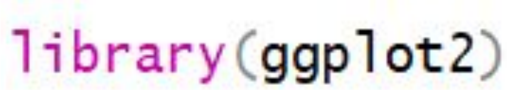
GGPLOT basics continued….



To display values, map variables in the data to visual properties of the geom (**aesthetics**) like **size**, **color**, and **x** and **y** locations.

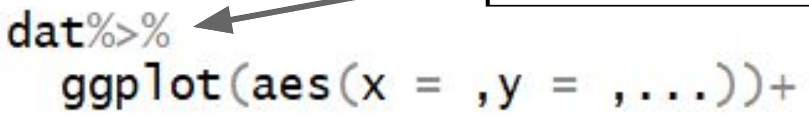
From ggplot2 cheatsheet:https://www.rstudio.com/resources/cheatsheets/

With PIPE: The basic anatomy of a ggplot...plot



```
library(ggplot2)
```

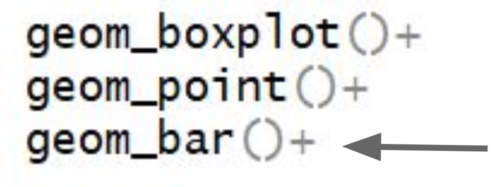
Remember to have the ggplot package loaded



```
dat%>%
  ggplot(aes(x = ,y = ,...))+
```

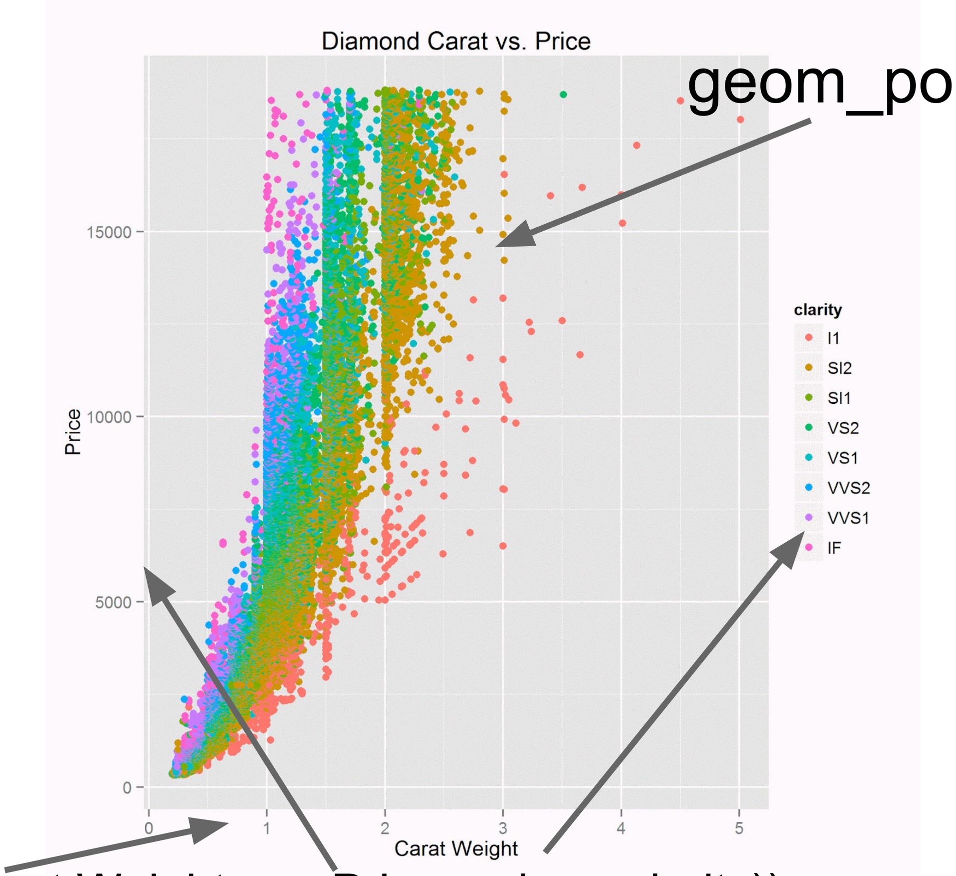
Start by specifying the **data** with variables

Then specify what is to be plotted on
x and y | aes = aesthetics
(position of x and y)



```
geom_boxplot()+
geom_point()+
geom_bar()+
```

Then, choose at least one **GEOM** - aka geometric object
They specify how your data will be plotted, e.g.
geom_point() -> scatterplots
geom_line() -> line plots, for trend lines

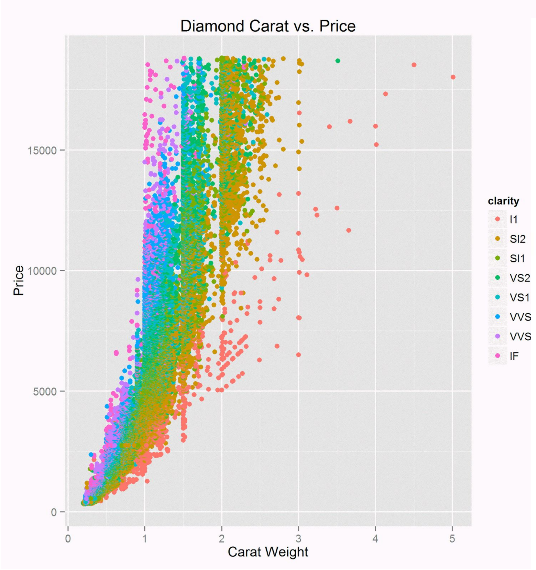


geom_point()

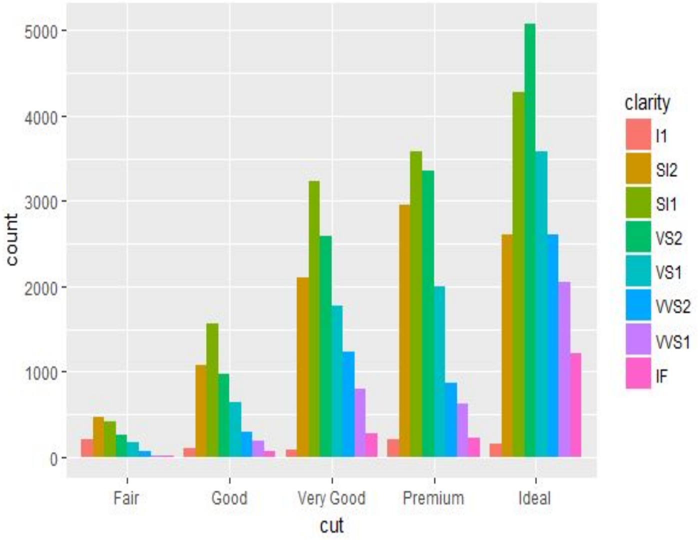
ggplot(aes(x = Carat Weight, y = Price, color = clarity))

Geom examples

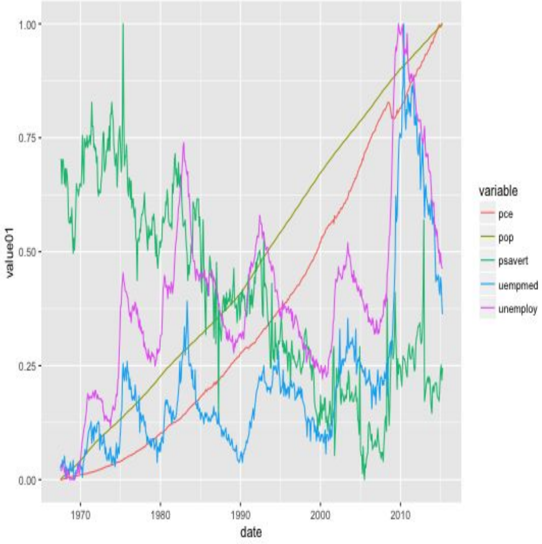
geom_point()



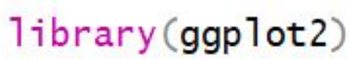
geom_bar()



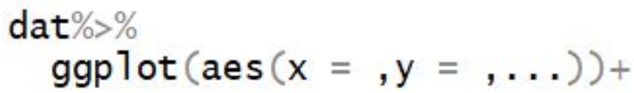
geom_line()



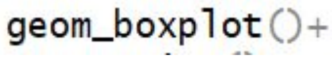
Customizing



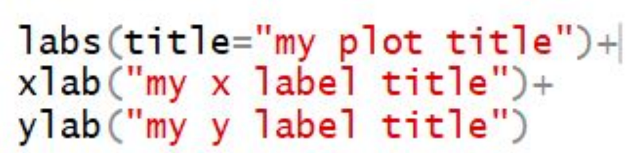
```
library(ggplot2)
```



```
dat%>%
  ggplot(aes(x = ,y = ,...))+
```

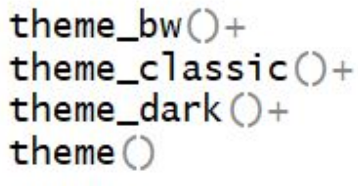


```
  geom_boxplot()+
```



```
  labs(title="my plot title")+
  xlab("my x label title")+
  ylab("my y label title")
```

By default, x and y labels will be the variable names in your “dat” [i.e. the dataframe with x and y], if you want to change you can with these command



```
  theme_bw()+
  theme_classic()+
  theme_dark()+
  theme()
```

You can also choose THE LOOK of your graph if you want. Here are some examples. It is also possible to create your own custom theme

#rcatladies

Challenge !

Create your own graph!

Ideas:

1) Scatterplot of age (x) versus fare (y) with survived as colors
2) Passenger class (x) versus fare (y) with survived as colors

What’s next?

- **May** - RShiny workshop with Ozum and Akshi
- **June** - TBC
- **July** - no meetup
- **August** - Hadley Wickham

Intermediate and advance R **beginner** workshops coming up!