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R Basics— knowing your way around

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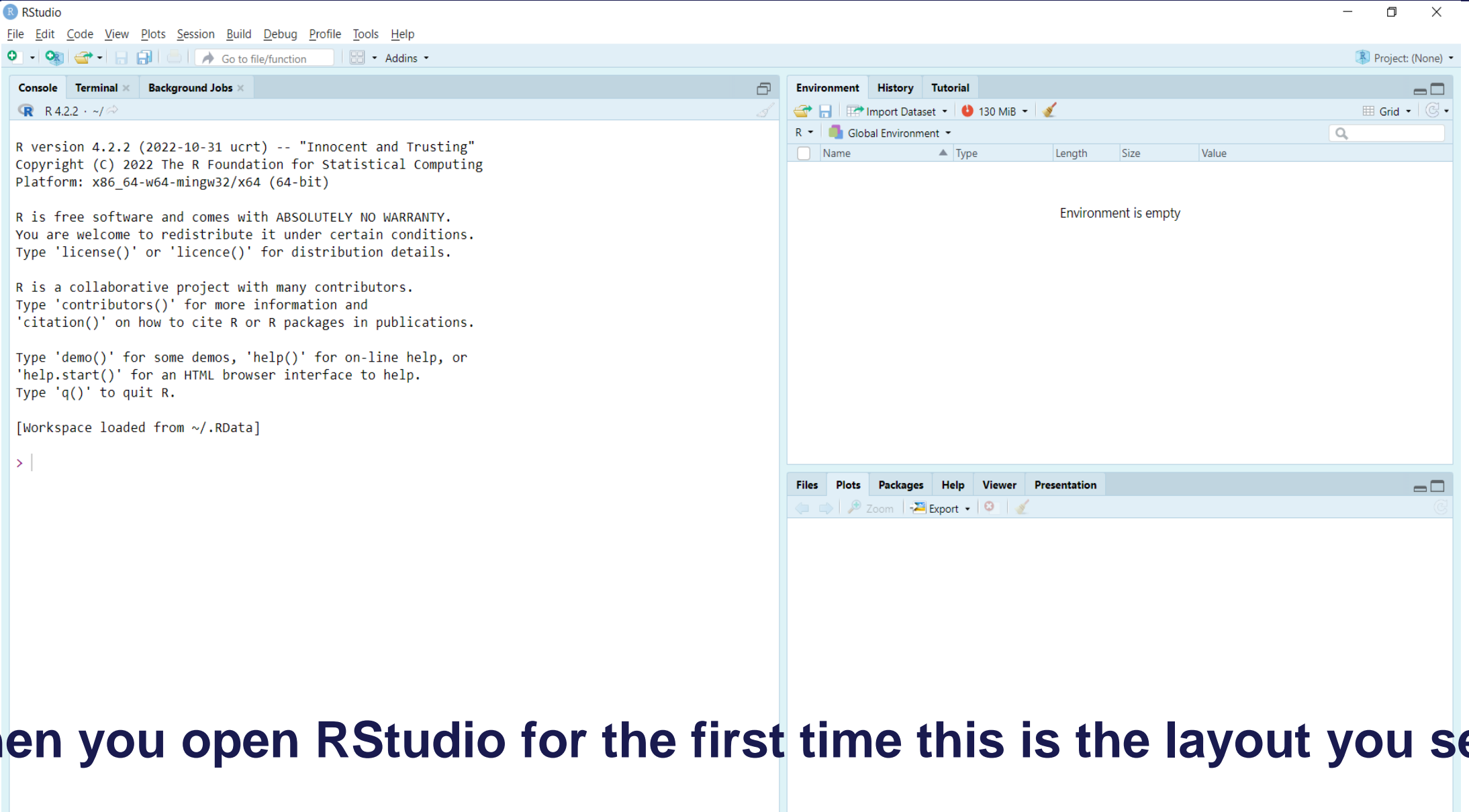


Introduction to R and RStudio

- **R is a popular programming language for statistical computing and graphics.**
- **R is open-source, and there are many external packages suited for different purposes (e.g., data cleaning, visualization)**
- **RStudio, on the other hand, is an Integrated Environment (IDE) for R and is available in two formats: RStudio Desktop & RStudio server**



RStudio interface



When you open RStudio for the first time this is the layout you see



Console

- The Console is the workhorse of R. This is where R evaluates all the code you write.

```
Console Terminal Background Jobs
R 4.2.2 · ~/
R version 4.2.2 (2022-10-31 ucrt) -- "Innocent and Trusting"
Copyright (C) 2022 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 loaded from ~/.RData]

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

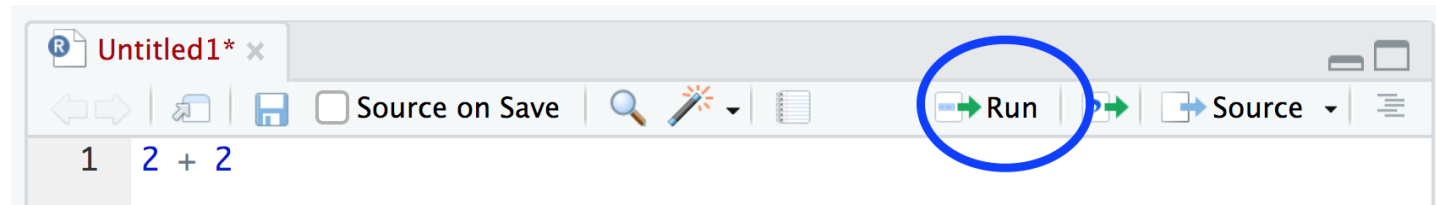
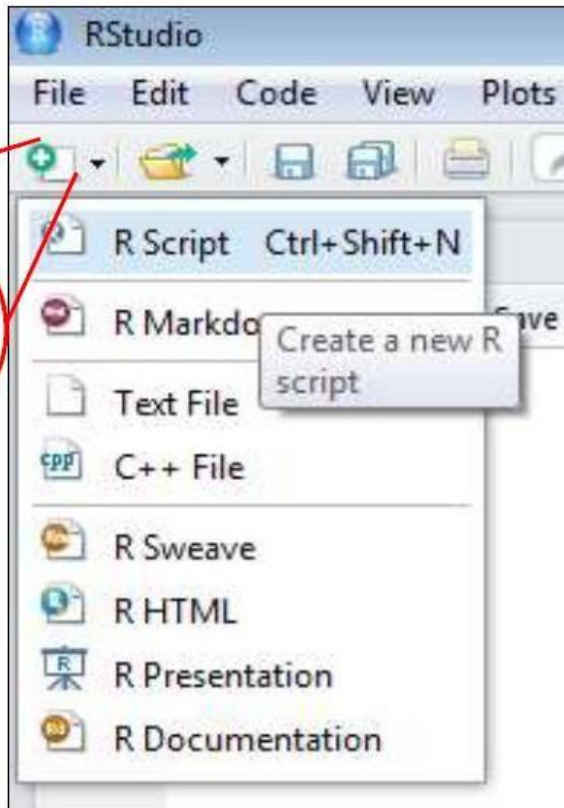
You can type R code directly into the Console at the command line prompt, **>**.

e.g. Please type **2+2** in the console and press the enter key



R Script

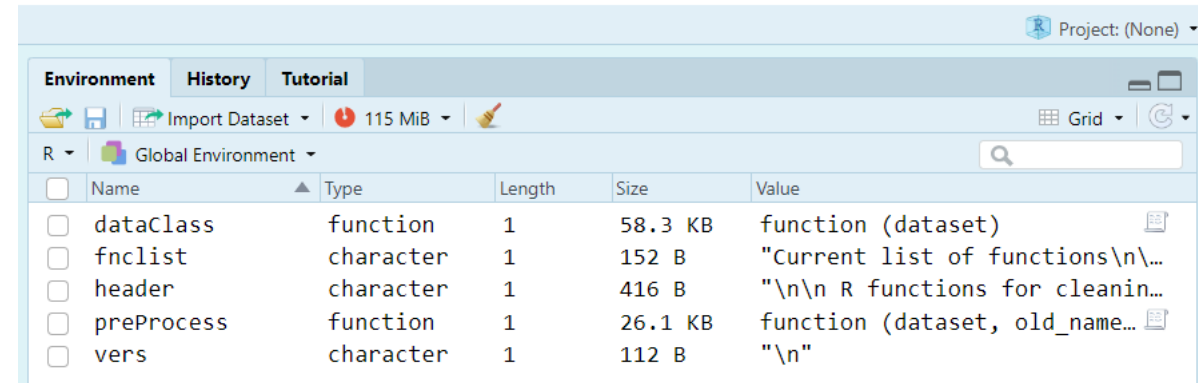
- Instead of typing R code directly into the Console a better approach is to create an R script.
- The new window is a script editor and where you will write your code, execute, and save it.
- e.g. Please type **2+2** in the script and **click the icon run**





Environment/History/Tutorial

- The Environment / History / Tutorial window shows you lots of useful information.
- The 'Environment' tab displays all the objects you have created in the current (global) environment.
- The 'History' tab contains a list of all the commands you have entered into the R Console.



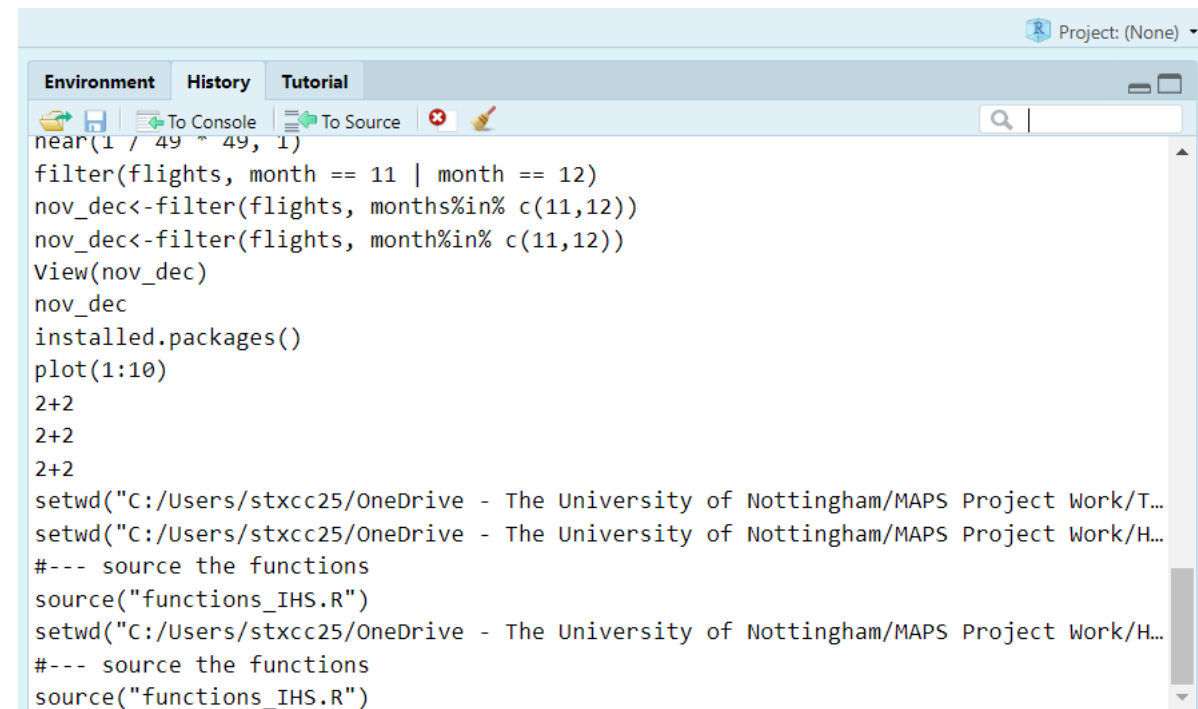
Project: (None)

Environment History Tutorial

Import Dataset 115 MiB

R Global Environment

<input type="checkbox"/>	Name	Type	Length	Size	Value
<input type="checkbox"/>	dataClass	function	1	58.3 KB	function (dataset)
<input type="checkbox"/>	fnclist	character	1	152 B	"Current list of functions\n\..."
<input type="checkbox"/>	header	character	1	416 B	"\n\n R functions for cleanin..."
<input type="checkbox"/>	preProcess	function	1	26.1 KB	function (dataset, old_name...
<input type="checkbox"/>	vers	character	1	112 B	"\n"



Project: (None)

Environment History Tutorial

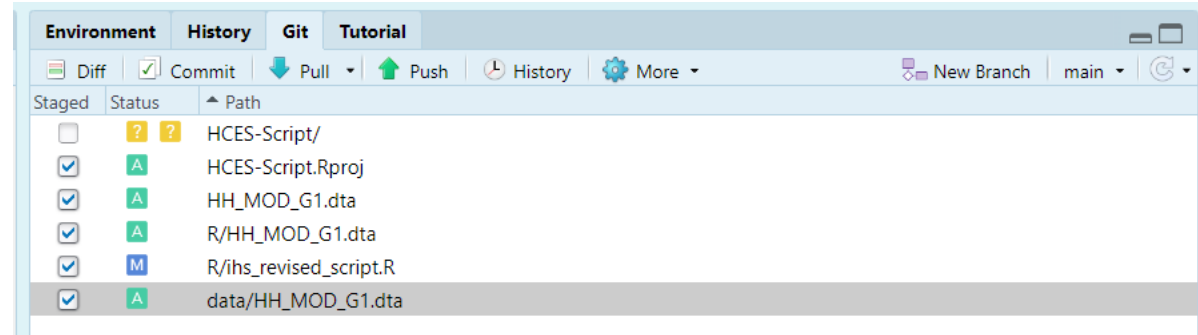
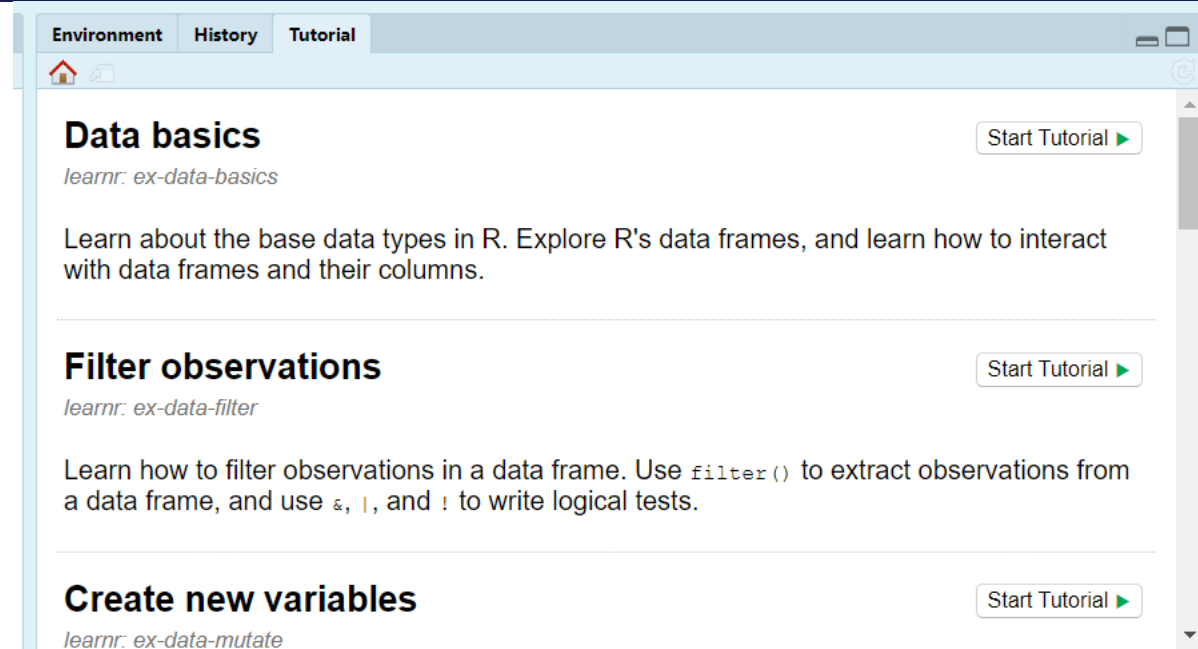
To Console To Source

```
near(1 / 49 ~ 49, 1)
filter(flights, month == 11 | month == 12)
nov_dec<-filter(flights, months%in% c(11,12))
nov_dec<-filter(flights, month%in% c(11,12))
View(nov_dec)
nov_dec
installed.packages()
plot(1:10)
2+2
2+2
2+2
setwd("C:/Users/stxcc25/OneDrive - The University of Nottingham/MAPS Project Work/T...
setwd("C:/Users/stxcc25/OneDrive - The University of Nottingham/MAPS Project Work/H...
#--- source the functions
source("functions_IHS.R")
setwd("C:/Users/stxcc25/OneDrive - The University of Nottingham/MAPS Project Work/H...
#--- source the functions
source("functions_IHS.R")
```



Environment/History/Tutorial

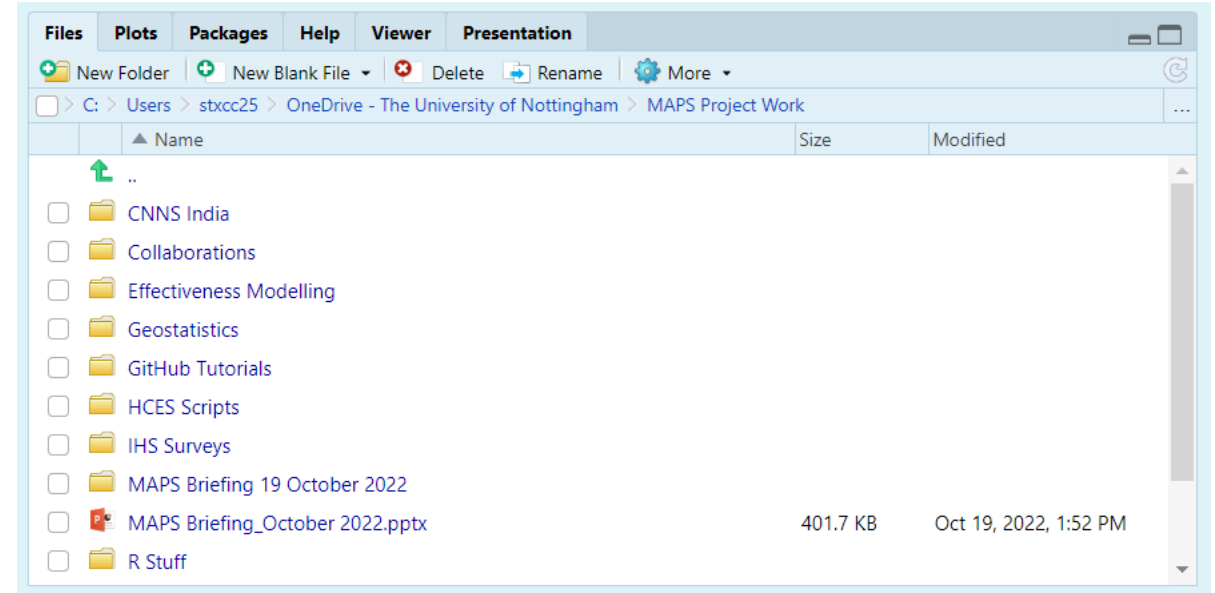
- The **Tutorial** tab allows you to access tutorials to help you better understand RStudio (very helpful resources there)
- The **Git** tab provides a links with your GitHub account (NB: this will appear later)





Files/Plots/Packages/Help/Presentation

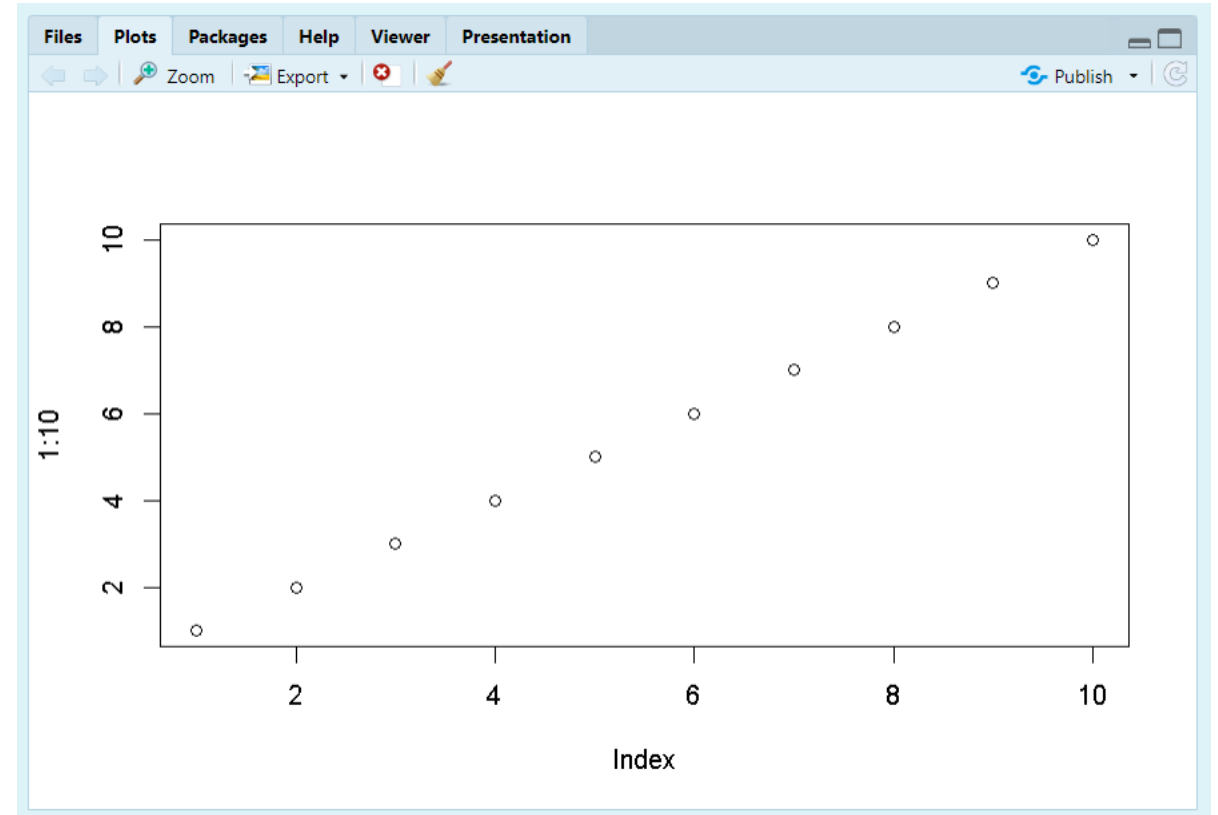
- The **'Files'** lists all external files and directories in the current working directory on your computer.
- The **'Packages'** tab lists all of the packages that you have installed on your computer.





Files/Plots/Packages/Help/Presentation

- The **Plot** tab is where all the plots you create in R are displayed (unless you tell R otherwise)– you can export, zoom your images
- The **Help** tab displays the R help documentation for any function.

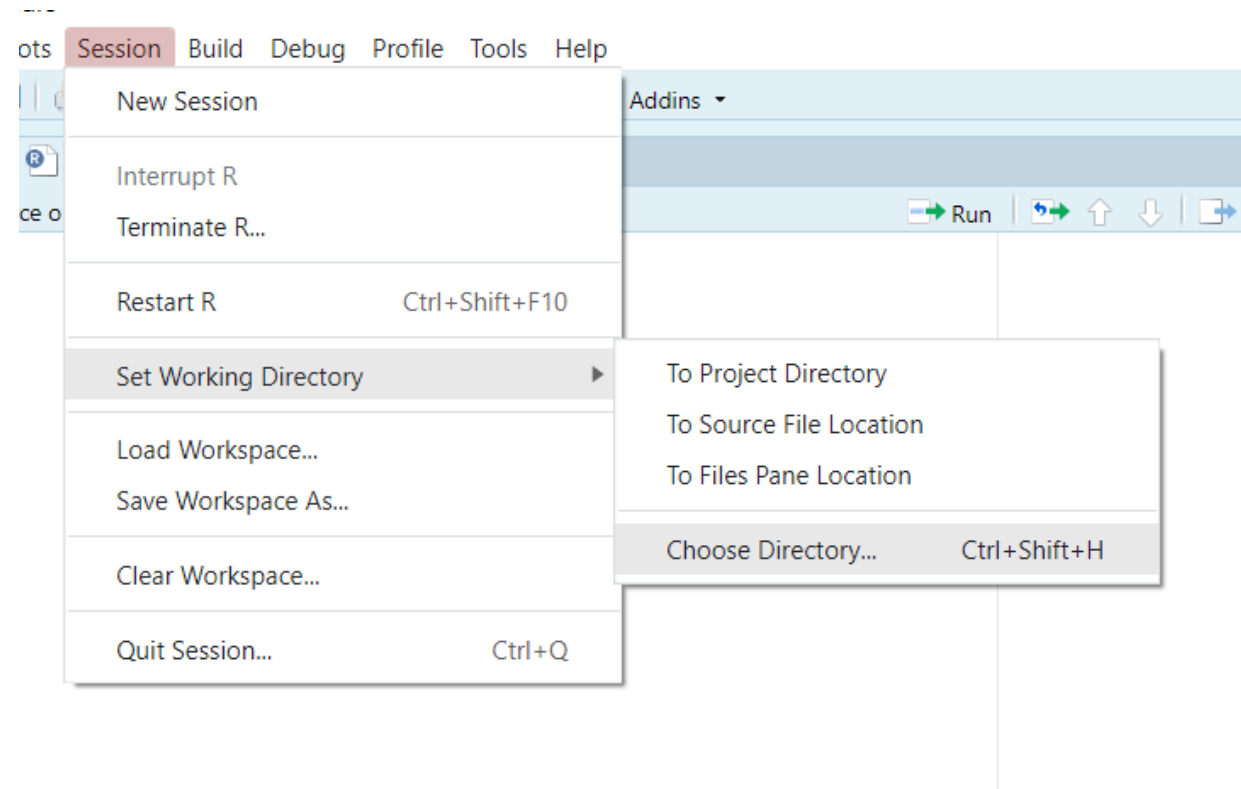


Can you type **plot(1:10)** in your script



Working directories

- The working directory is the default location where R will look for files you want to load and where it will put any files you save.
- **setwd()** function uses an absolute file path which is specific to the computer you are working on
- **getwd()** function in the Console which returns the file path of the current working directory





Any questions so far?



Objects in R

- **Everything in R is an object**
- **Objects - can be almost anything, from a single number or character string (like a word) to highly complex structures like the output of a plot, a summary of your statistical analysis or a set of R commands that perform a specific task.**
- **Can then assign a value to this object using the assignment operator `<-` (sometimes called the gets operator).**



Some R basics

- R is case sensitive i.e. **A** is not the same as **a** and **anova** is not the same as **Anova**.
- **#** symbol is interpreted as a comment and ignored by R.
- **+** appears in the console after you execute your code this means that you haven't completed your code correctly.
- R is fairly tolerant of extra spaces inserted into your code

Something fun: Please type the following in you script

```
A<-1
```

```
A<- 1
```

```
A < -1
```

What do you notice?



Basic arithmetic and variable assignment

- In its most basic form, R can be used as a simple calculator. Consider the following arithmetic operators:
- Add: +
- Subtract: -
- Multiply: *
- Divide: /
- Power: ^
- Modulo (remainder after division): %%



Basic data types in R

- **R works with numerous data types. Some of the most basic types to get started are:**
- **Numeric** – numbers e.g. (4.5, 4, 100)
- **Logical**– Boolean values e.g., true or false
- **Characters**– containers text (or string), numbers and special character e.g. “hello”



Basic arithmetic and variable assignment

Exercise 2.1

- In RStudio please open the script “**exer2.1.R**”
- Set a working directory
- In this exercise you’ll familiarise with basic arithmetic and variable assignment operations in R
- Then push your changes to GitHub



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Asante kwa kuwa makini