

Step-by-step R starter kit

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Install and open R Studio

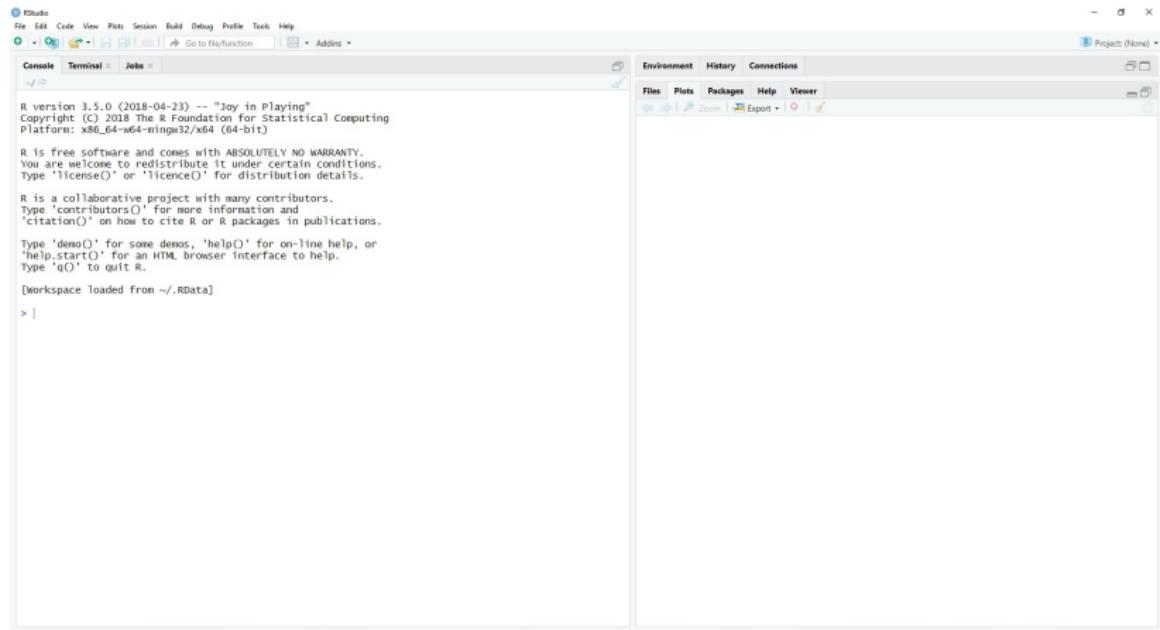
After installation, click the RStudio logo



Open R Studio

- ▶ You will see a console window - or place where your codes will be executed
- ▶ And a window consisted of 'Files', 'Plots', 'Packages', 'Help', 'Viewer' for viewing results, installing packages, etc in R
- ▶ You will also see a window consisted of 'Environment', 'History', and 'Connection' which is especially important if you want to check what variables have been set up, what models have you run, etc.

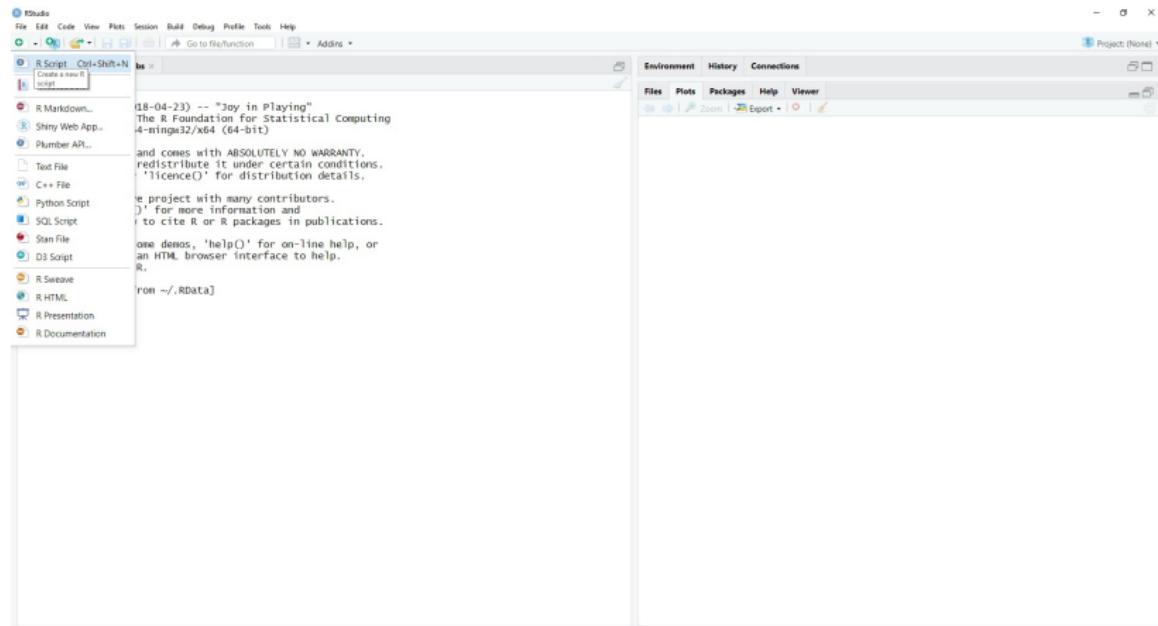
Open R Studio



Open script

- ▶ We usually work in an R script (extension '.R', e.g., file.R, script.R)
- ▶ This is where we usually write all our codes and notes, and run them in the console (using 'Run' command, or by clicking 'ctrl + enter' at the same time in R Studio)
- ▶ You can of course run your codes directly in console (type and then press enter), but you will lose it once you run it. That's why most people prefer to write everything in a script and then saved it in the desired folder. Coding in console is rarely done.

Open script



Open script

There are many other things you can do using R, e.g., R Markdown, prepare text file, C++ File, or Python script. But we'll start from the easiest part (regular script)

Write in a script

This is now the window (top left) where you can write the codes you'd like to run. Try sum $2 + 2$

Write in a script

The screenshot shows the RStudio interface. On the left, the 'Script Editor' window titled 'Untitled1.R' is open, showing a blank white space. On the right, the 'Console' window displays the R startup message and help text.

```
R version 3.5.0 (2018-04-23) -- "Joy in Playing"
Copyright (C) 2018 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]

> |
```

Write in a script

Put your cursor within the same line which you want to run, click Run or ctrl + enter

Write in a script

The screenshot shows the RStudio interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, Help, and Addins. A toolbar below the menu has icons for file operations like Open, Save, and Print, along with Go to Function and Run. The main workspace is titled 'Untitled1' and contains three tabs: 'Source on Save' (selected), 'Run the current line or selection (Ctrl+Enter)', and 'Source'. Below the workspace is a status bar with tabs for 'Console', 'Terminal', and 'Jobs'. The bottom pane is the 'Console' tab, which displays the R startup message and a prompt. The message includes:

```
R version 3.5.0 (2018-04-23) -- "Joy in Playing"  
Copyright (C) 2018 The R Foundation for Statistical Computing  
Platform: x86_64-w64-mingw32/x64 (64-bit)  
  
R is free software and comes with ABSOLUTELY NO WARRANTY.  
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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  
'?ip.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.  
  
[workspace loaded from ~/RData]  
> |
```

Write in a script

The screenshot shows the RStudio interface. On the left, the 'Script Editor' window displays a script named 'Untitled1.R' with the code `2 + 2`. On the right, the 'Console' window shows the output of running this script, which includes the R startup message, license information, and the result of the calculation `[1] 4`.

```
R version 3.5.2 (2018-12-20) -- "Sunny,明るい日"
```

```
Copyright (C) 2018 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
>
```

Write in a script

The screenshot shows the RStudio interface. On the left, the 'Script Editor' pane displays an R script with the following code:

```
1 2 + 2
2 y = 2 +
```

On the right, the 'Console' pane shows the output of running this script. It starts with the R startup message, followed by the execution of the code, resulting in the value 4.

```
R version 3.5.2 (2018-12-20) -- "Shorten My Shorty"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

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'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
> |
```

Write in a script

Sometimes, you're dealing with a very long code while you only want to run a part of it. You can bold the code lines you want to run, and click Run or `ctrl + enter`

Write in a script

The screenshot shows the RStudio interface with the following components:

- Script Editor:** An R Markdown file titled "skip.rmd" containing the following R code:

```
1 setwd("D:\\[61] R starter kit\\Step by step")
2 getwd()
3
4 x = 2 + 3
5 y = 2 + 2
6 y
7 mtcars
8 df
9 library(ggplot2)
10 install.packages(ggplot2)
11 library(vtable)
12 vtable(mtcars)
13 t
```
- Environment Pane:** Shows the global environment with objects like calc1, calc1.aov, df, my_data, p, t, and y.
- Viewer Pane:** Displays the "vtable (mtcars)" output, which includes a summary of the mtcars dataset and a detailed variable table.
- Console Output:** Shows the R session history, including the download of ggplot2 and the execution of the script code.

```
D:\\[61] R starter kit\\Step by step
-- trying URL 'https://cran.rstudio.com/bin/windows/contrib/3.5/ggplot2_3.2.1.zip'
Content type: application/zip length: 3960417 bytes (3.8 MB)
downloaded 3.8 MB

package 'ggplot2' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
  C:\Users\WCS Indonesia\AppData\Local\Temp\RtmpqoAxUk\downloaded_packages
> library(ggplot2)
Warning message:
package 'ggplot2' was built under R version 3.5.3
> library(vtable)
Warning message:
package 'vtable' was built under R version 3.5.3
> vtable(mtcars)
> setwd("D:\\[61] R starter kit\\Step by step")
> getwd()
[1] "D:\\[61] R starter kit\\Step by step"
> |
```

Assign values to variables

In R, we are often to assign certain values to certain variables. For example, I'd like to assign value of sum of $2 + 2$ to variable y . We can 'call' y back by click the 'Run' button or 'ctrl + enter' to see what the variable y contains.

Assign values to variables

The screenshot shows the RStudio interface with the following details:

- Code Editor:** Shows an R script named "Untitled1.R" with the following content:

```
1 2 + 2
2 y = 2 +
```
- Environment View:** Displays the variable `y` with the value `4`.
- Console View:** Shows the R command-line interface output:

```
R version 3.5.2 (2018-12-20) -- "Joyful Holiday"
Copyright (C) 2018 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

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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.

[workspace loaded from ~/RData]

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

Assign values to variables

The screenshot shows the RStudio IDE interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, Help, and Project (None). The code editor on the left contains an 'Untitled1.R' file with the following code:

```
1 2 + 2
2 y = 2 + 2
3 y
4
```

The environment pane on the right shows the following objects:

Environment	Value
y	4

The bottom pane is the R Console, titled 'Console' (Top Level), showing the results of the R code execution:

```
R> 2 + 2
[1] 4
R> y = 2 + 2
R> y
[1] 4
R>
```

The use of hashtag '#' sign

- ▶ The hashtag sign, when written in R usually implies that the text after within the same line will not be read by R. This is useful if you want to add notes.
- ▶ See what happened if we assign variable y with 2+2 and variable x with the same value, but with hashtag sign preceding the x variable

The use of hashtag '#' sign

The screenshot shows the RStudio interface with the following components:

- Code Editor:** An R script named "Untitled1.R" containing the following code:

```
1 y = 2+2
2 #x=2+2
3
4 y
5 x
6
```
- Console:** Displays the output of running the script:

```
D:\[...]\R starter kit\Step by step> source("D:/[...]/R starter kit/Untitled1.R")
#> [1] "x=2+2"
#> [1] "y=2+2"
#> [1] "y=4"
#> [1] "x=NA"
```
- Environment:** Shows the global environment with objects like calc1, calc1.aov, df, my_data, p, t, and y.
- Viewer:** Displays the "mtcars" dataset information and a preview of the first few rows.

The use of hashtag '#' sign

The screenshot shows the RStudio interface with the following components:

- Top Bar:** File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, Help.
- Left Sidebar:** Project (None), List, Global Environment, Data, Values, t, y.
- Code Editor:** Untitled1.Rmd, containing the R code: `y = 2+2` and `#x=2+x`.
- Console:** Shows the execution of the code, with the last line failing: `Error: object 'x' not found`.
- Environment Tab:** Shows objects: calc1, calc1.aov, df, my_data, p, t, y.
- Plots Tab:** Shows a histogram of the 'mpg' column from the mtcars dataset.
- Variables Tab:** Shows the mtcars dataset with 32 rows and 11 columns. A table of variable details is also shown.

Name	Class	Values
mpg	numeric	Num: 10.4 to 33.9
cyl	numeric	Num: 4 to 8
disp	numeric	Num: 71.1 to 472
hp	numeric	Num: 52 to 335
drat	numeric	Num: 2.76 to 4.93
wt	numeric	Num: 1.513 to 5.424
qsec	numeric	Num: 14.5 to 22.9
vs	numeric	Num: 0 to 1

The use of hashtag '#' sign

Variable x is unreadable/not found

The use of hashtag '#' sign

The screenshot shows the RStudio interface with the following components:

- Top Bar:** File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, Help.
- Left Panel:** A script editor window titled "Untitled1.R" containing the following R code:

```
1 y = 2+2
2 #x=2+2
3
4 y #we can read variable y, but not x
5
6
```
- Environment Tab:** Shows the global environment with objects like calc1, calc1.aov, df, my_data, p, t, and y.
- Console Tab:** Displays the R console history:

```
>
>
>
>
>
>
>
>
>
>
> y = 2+2
> y
[1] 4
> x
Error: object 'x' not found
> y #we can read variable y, but not x
[1] 4
>
```
- Plots Tab:** Not visible in the screenshot.
- Packages Tab:** Not visible in the screenshot.
- Help Tab:** Not visible in the screenshot.
- Viewer Tab:** Shows the "mtcars" dataset as a Variable Table:

This data contains 32 rows and 11 columns.

Name	Class	Values
mpg	numeric	Num: 10.4 to 33.9
cyl	numeric	Num: 4 to 8
disp	numeric	Num: 71.1 to 472
hp	numeric	Num: 52 to 335
drat	numeric	Num: 2.76 to 4.93
wt	numeric	Num: 1.513 to 5.424
qsec	numeric	Num: 14.5 to 22.9
vs	numeric	Num: 0 to 1
- Project Tab:** Project: (None)

The use of hashtag '#' sign

The y variable is safely read even when you have # sign - if written after the code you want to read

Fourth window

There are some important functions in the fourth window. First is *Files* related to all files we're currently using in the environment.

Fourth window

The screenshot shows the RStudio interface with four main panes:

- Code Editor:** Displays an R script named "Untitled" with the code:

```
1 2 + 2
2 y = 2 + 2
3 y
4
```
- Environment:** Shows the global environment with objects:
 - calc1: 36 obs. of 3 variables
 - calc1.aov: List of 13
 - df: 15 obs. of 5 variables
 - my_data: 72 obs. of 3 variables
 - p: List of 9
- Global Environment:** Shows the global environment with objects:
 - t: Named num [1:9] 183 NA 9132 NA 1978 ...
 - y: 4
- File Browser:** Shows the file structure under "Name":

Name	Size	Modified
AData	31.5 KB	Aug 9, 2019, 7:56 PM
Amrion	68 B	Sep 21, 2019, 7:44 AM
Hhistory	4 kB	Oct 13, 2019, 6:44 AM
jetget-hsts	177 B	Jul 12, 2019, 6:35 PM
Custom Office Templates		
tg1.jpg	227.6 kB	Nov 10, 2019, 11:59 PM
gadm36_ION_1.shp.rds	15.2 MB	Jul 3, 2019, 10:05 PM
etterR-0.2.14.tar.gz	10.9 MB	Sep 9, 2019, 9:21 PM
etterR-0.2.14.zip	11 MB	Sep 9, 2019, 9:23 PM
R		
rstudio-pandoc		
YRU		

Fourth window

Plots is where display the plot we're currently making. For example, here, we make a histogram from the dataset *mtcars*, to see spread of data for variable *wt*. *mtcars* is a dataset which is freely available in R environment, and can be called upon anytime (people usually use this for examples like what I'm doing now :D).

Fourth window

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Untitled

Source on Save | Run | Source | Addins | Project (None) ▾

```
1 2 + 2
2 y = 2 + 2
3
4 hist(mtcars$wt)
```

Environment History Connections

Global Environment ▾

Object	Type	Value
calc1	36 obs. of 3 variables	
calc1.aov	List of 13	
df	15 obs. of 5 variables	
my_data	72 obs. of 3 variables	
p	List of 9	

Values

Object	Type	Value
t	Named num [1:9] 183 NA 9132 NA 1978 ...	
y	4	

Console Terminal Jobs

R Script

```
Copyright (C) 2012 The R Foundation for Statistical Computing
R is a collaborative project with many contributors.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

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
> y = 2 + 2
> y
[1] 4
> hist(mtcars$wt)
> |
```

Files Plots Packages Help Viewer

Zoom Export Publish

Histogram of mtcars\$wt

A histogram titled "Histogram of mtcars\$wt". The x-axis is labeled "mtcars\$wt" and ranges from 2 to 5. The y-axis is labeled "Frequency" and ranges from 0 to 8. The histogram shows the distribution of car weights, with the highest frequency occurring between 2.8 and 3.2.

Weight Range	Frequency
[2.0, 2.4)	4
[2.4, 2.8)	4
[2.8, 3.2)	8
[3.2, 3.6)	7
[3.6, 4.0)	1
[4.0, 4.4)	0
[4.4, 4.8)	2

Fourth window

Although we can run many basic codes, including many classical statistical tests (anova, linear regression, chi-square tests, etc), in the R environment, R is built by plenty of programmers who write *packages* which consisted of codes, lists, formula, datasets, to help R users to do what they want to do.

Fourth window

The screenshot shows the RStudio interface with four main panes:

- Environment:** Shows the global environment with objects like `calc1`, `df`, `my_data`, `p`, `t`, and `y`.
- Packages:** Shows a list of installed packages, each with a checkbox, version number, and a "Details" link. The packages listed are:

Name	Description	Version
GGally	Extension to 'ggplot2'	1.4.0
gforce	Accelerating 'ggplot2'	0.3.1
gmap	Spatial Visualization with ggplot2	3.0.0
ggplot2	Create Elegant Data Visualisations Using the Grammar of Graphics	3.2.1
gapmubr	'ggplot2' Based Publication Ready Plots	0.2.1
graph	An Implementation of Grammar of Graphics for Graphs and Networks	2.0.0
gridtext	Automatically Position Non-Overlapping Text Labels with 'ggplot2'	0.8.1
gsosci	Scientific Journal and Sci-Fi Themed Color Palettes for 'ggplot2'	2.9
gsignif	Significance Brackets for 'ggplot2'	0.5.0
cowplot	Streamlined Plot Theme and Plot Annotations for 'ggplot2'	0.9.4
pligr	The 'plig' C++ Logging Library	0.2.0
tidytext	Text Mining using 'dplyr', 'ggplot2', and Other Tidy Tools	0.2.2
- Console:** Displays the R session history:

```
> 2 + 2
[1] 4
> y = 2 + 2
> y
[1] 4
> hist(mtcars$wt)
> |
```
- Source:** Shows the code in the current script file.

Fourth window

For example, package *ggplot2* is used to make ‘pretty graphs’ with easily written codes. We will explore for now, how to install a package and read it into an environment so it will be usable.

Fourth window

The screenshot shows the RStudio interface with four main panes:

- Environment:** Shows the global environment with objects like `calc1`, `df`, `my_data`, `p`, `t`, and `y`.
- Console:** Displays R session history, including code execution and package loading.
- Packages:** Shows available packages, with `ggplot2` selected for updating.
- Project:** Shows a project named "None".

Code in the Environment pane:

```
1 2 + 2
2 y = 2 + 2
3 
4 hist(mtcars$wt)
5 library(ggplot2)
6
```

Console output:

```
6.1 (Top Level) 
Console Terminal Jobs 
/---/ 
?help.start() for an HTML browser interface to help. 
Type 'q()' to quit R. 
[workspace loaded from ~/RData] 
> 2 + 2 
[1] 4 
> y = 2 + 2 
> 
[1] 4 
> hist(mtcars$wt) 
> library(ggplot2) 
Warning message: 
  package 'ggplot2' was built under R version 3.5.3 
> detach("package:ggplot2", unload = TRUE) 
> library(ggplot2) 
Warning message: 
  package 'ggplot2' was built under R version 3.5.3 
> remove.packages("ggplot2", lib=~/R/win-library/3.5") 
> |
```

Packages pane:

Name	Description	Version
cowplot	Streamlined Plot Theme and Plot Annotations for 'ggplot2'	0.9.4
Ggally	Extension to 'ggplot2'	1.4.0
ggridge	Accelerating 'ggplot2'	0.3.1
ggsave	Spatial Visualization with 'ggplot2'	3.0.0
gridExtra	'ggplot2'-Based Publication Ready Plots	0.2.1
gridtext	Automatically Position Non-Overlapping Text Labels with 'ggplot2'	0.8.1
gisci	Scientific Journal and Sci-Fi Themed Color Palettes for 'ggplot2'	2.9
ggsignif	Significance Brackets for 'ggplot2'	0.5.0
tidytext	Text Mining using 'dplyr', 'ggplot2', and Other Tidy Tools	0.2.2

Fourth window

First option is by clicking the tab *Packages* in the fourth window. It will show you the list of packages which are currently in R environment. If this is the first time you are opening R, you won't have *ggplot2* yet installed. So click the *install* sign, and then...

Fourth window

The screenshot shows the RStudio interface with four main panes:

- Code Editor:** Displays an R script named "Untitled1.R" with the following content:

```
1 2 + 2
2 y = 2 + 2
3
4 hist(mtcars$wt)
5 library(ggplot2)
```
- Environment:** Shows the global environment with objects like `calci`, `df`, `my_data`, and `t`. The value of `t` is listed as `Named num [1:9] 183 NA 9132 NA 1978 ... 4`.
- Help Viewer:** Shows the help page for the `ggplot2` package, which includes sections for `ggplot2`, `ggplot2movies`, `ggplot2dA`, `ggplot2ui`, and `ggplotly`. It lists various functions and their descriptions.
- Install Packages:** A modal dialog box titled "Install Packages" is open, showing the "Repository (CRAN)" dropdown set to "Configuring Repositories". The search bar contains "ggplot". Several packages are listed in the results, including `ggplot2`, `ggplot2movies`, `ggplot2dA`, `ggplot2ui`, and `ggplotly`. Buttons for "Install" and "Cancel" are at the bottom.

Fourth window

a command box will show up, asking you to install from CRAN depositories. Write the package you want to install, and then click *Install*.

You can also install a package by running a code of line `install.packages()` as you can see in the following...

Fourth window

The screenshot shows the RStudio interface with four panes:

- Code Editor (Top Left):** Displays R code for generating a histogram and installing ggplot2. A tooltip for 'ggplot2' provides its documentation.
- Environment (Top Right):** Shows the global environment with objects like 'calci', 'df', 'my_data', and 'p'.
- Console (Bottom Left):** Shows the R console output. It includes a warning about 'ggplot2' being replaced by 'Rtools', the command to install 'ggplot2', and the download progress of the package.
- Help (Bottom Right):** Shows the 'gg' package page on CRAN, listing packages related to 'ggplot2' such as 'gridExtra', 'grid', 'gridSVG', etc.

```
1 2 + 2
2 y = 2 + 2
3
4 hist(mtcars$wt)
5 library(ggplot2)
6 install.packages('ggplot2')

ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics
A system for 'declaratively' creating graphics, based on "The Grammar of Graphics". You provide the data, tell 'ggplot2' how to map variables to aesthetics, what graphical primitives to use, and it takes care of the details.

Press F1 for additional help.

625 (Top Level) R Script
Console Terminal Jobs
- f

Warning: namespace 'ggplot2' is not available and has been replaced
by .GlobalEnv when processing object 'p'
[Workspace loaded from ./RData]

> install.packages("ggplot2")
WARNING: Rtools is required to build R packages but is not currently installed. Please download and
install the appropriate version of Rtools before proceeding.

https://cran.rstudio.com/bin/windows/Rtools/
Installing package into 'C:/Users/WCS Indonesia/Documents/R/win-library/3.5'
(as 'lib' is unspecified)
trying URL 'https://cran.rstudio.com/bin/windows/contrib/3.5/ggplot2_3.2.1.zip'
Content type: 'application/zip' length 3960417 bytes (3.8 MB)
downloaded 3.8 MB

package 'ggplot2' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
  C:/Users/WCS Indonesia/AppData/Local/Temp/Rtmpq0AXuk/downloaded_packages
>
```

Fourth window

After installing the package, you now need to *read it into* the environment. Usually, R Users write down a list of packages they need to install at the beginning of a script so a person wouldn't miss a package. To read the package, you can open the 'Packages' tab, search the title of the package, and 'tick' the box.

Fourth window

The screenshot shows the RStudio interface with four main panes:

- Code Editor (Top Left):** Displays an R script named "Untitled.R" with the following code:

```
1 2 + 2
2 y = 2 + 2
3
4 hist(mtcars$wt)
```
- Environment (Top Right):** Shows the global environment with objects like `calc1`, `df`, `p`, and `my_data`. It also lists values for `t` and `y`.
- Plots (Bottom Left):** Shows a histogram of the `mtcars$wt` variable.
- Packages (Bottom Right):** Shows the CRAN repository search results for `ggplot2`, listing various packages and their details.

Console output (Bottom Left):

```
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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
> y = 2 + 2
[1] 4
> hist(mtcars$wt)
> library(ggplot2)
Warning message:
package 'ggplot2' was built under R version 3.5.3
|
```

Fourth window

Or, you can write a line of code `library()` and it will give the same result. See the following figure.

Fourth window

The screenshot shows the RStudio interface with four main windows open:

- Environment:** Shows the global environment with objects like `calc1`, `df`, `my_data`, and `t`. It also lists values for `t` and `y`.
- Plots:** A small preview window showing a histogram.
- Packages:** A list of available packages. `ggplot2` is checked as installed, while others like `cowplot`, `GGally`, `gridExtra`, `ggnmp`, `ggnur`, `ggrepel`, `ggsci`, `ggsignif`, and `tidytext` are shown as available for installation.
- Help:** A search bar with the query `ggplot`.

The left sidebar shows the current workspace and the console tab is active, displaying the following R session history:

```
2 + 2
[1] 4
y = 2 + 2
> y
[1] 4
> hist(mtcars$wt)
> library(ggplot2)
Warning message:
package 'ggplot2' was built under R version 3.5.3
> detach("package:ggplot2", unload = TRUE)
> library(ggplot2)
Warning message:
package 'ggplot2' was built under R version 3.5.3
> |
```

Fourth window

You can also check the *Help* tab to find codes, or packages that you don't know what it is about. For example, type *ggplot2* in the search column and then click enter.

Fourth window

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Untitled1* R Script

```
1 2 + 2
2 y = 2 + 2
3
4 hist(iris$Sepal.Length)
5 library(ggplot2)
6 install.packages(ggplot2)
```

Run Source

Environment History Connections

Global Environment

Data

- calc1 36 obs. of 3 variables
- calc1.aov List of 13
- df 15 obs. of 5 variables
- my_data 72 obs. of 3 variables
- p List of 9

Values

t	Named num [1:9] 183 NA 9132 NA 1978 ...
y	4

Console Terminal Jobs

7:1 (Top Level) R Script

```
> install.packages("ggplot2")
WARNING: Rtools is required to build R packages but is not currently installed. Please download and
install the appropriate version of Rtools before proceeding:

https://cran.rstudio.com/bin/windows/Rtools/
Installing binary package from 'C:/Users/MCS Indonesia/Documents/R/win-library/3.5'
(6.1Mb) unzipping...
trying URL 'https://cran.rstudio.com/bin/windows/contrib/3.5/ggplot2_3.2.1.zip'
Content type 'application/zip' length 3960417 bytes (3.8 MB)
downloaded 3.8 MB

package 'ggplot2' successfully unpacked and MD5 sums checked
```

The downloaded binary packages are in
C:/Users/MCS Indonesia/AppData/Local/Temp/RtmpqDAXUk/downloaded_packages

```
> library(ggplot2)
Warning message:
package 'ggplot2' was built under R version 3.5.3
> |
```

Project: (None)

Files Plots Packages Help Viewer

ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics

Description

A system for ‘declaratively’ creating graphics, based on “The Grammar of Graphics”. You provide the data, tell ggplot2 how to map variables to aesthetics, what graphical primitives to use, and it takes care of the details.

Author(s)

Maintainer Hadley Wickham hadley@rstudio.com

Authors:

- Winston Chang



Fourth window

Using the *Viewer* tab, you can view various type of items you want to check. I'm using here a package called `vtable` and I executed a command line which tells R to read what is in variable `mtcars`.

Fourth window

The screenshot shows the RStudio interface with four windows open:

- Code Editor:** An "Untitled" script containing R code. The code includes:

```
1 2 + 2
2 y = 2 + 2
3
4 hist(mtcars$wt)
5 library(ggplot2)
6 install.packages(ggplot2)
7 library(vtable)
8 vtable(mtcars)
9
```
- Environment:** A panel showing the global environment. It lists objects such as `calci`, `calci.aov`, `df`, `my_data`, `p`, and `t`. `t` is described as a "Named num [1:9] 183 NA 9132 NA 1978 ...".
- Global Environment:** A detailed view of the `t` object, showing its structure as a named vector with values: 183, NA, 9132, NA, 1978, ...
- Console:** A log of R session activity. It shows the installation of the `ggplot2` package, the execution of the provided R code, and the loading of the `mtcars` dataset.
- Data View:** A table titled "Variable Table" showing the structure of the `mtcars` dataset. The table has columns for Name, Class, and Values.

Name	Class	Values
mpg	numeric	Num: 10.4 to 33.9
cyl	numeric	Num: 4 to 8
disp	numeric	Num: 71.0 to 472
hp	numeric	Num: 52 to 335
drat	numeric	Num: 2.76 to 4.93
wt	numeric	Num: 1.513 to 5.424
qsec	numeric	Num: 14.5 to 22.9
vs	numeric	Num: 0 to 1
am	numeric	Num: 0 to 1
gear	numeric	Num: 3 to 5
carb	numeric	Num: 1 to 8

Second window

In the second window, you can see *Environment*, *History*, and *Connections* tabs. Usually the *Environment* tab is useful, in which you can see the variables or dataset you're currently using. Here you can see the *y* variable we earlier made.

Setting working directory

Setting working directory helps you to work more easily in R. Once you read a certain working directory, figures, scripts, dataset, can be saved in this working directory and you can read them too directly. You should not put the files in any root directory though, because it won't be read by R. R will only read files within the same folder. Careful with the \\ and / sign while setting the working directory.

Setting working directory

D:\Temporary work folder\{40] R ladies\Meeting 2\Day 1

File Home Share View

← → ⌂ ⌃ ⌄ This PC > DATA (D:) > Temporary work folder > [40] R ladies > Meeting 2 > Day 1

Name	Date modified	Type	Size
birds.csv	11/06/2019 10:42	XLS Worksheet	1 KB
birds.txt	11/06/2019 10:42	Text Document	1 KB
Flagognna_2014_UM.txt	11/06/2019 10:42	Text Document	16 KB
Stat 101_Day 1_1_Warming up Arithmetic...	11/06/2019 10:42	R File	3 KB
Stat 101_Day 1_2_R.intro.R	11/06/2019 10:42	R File	5 KB
Stat 101_Day 1_3_Exercise answer.R	11/06/2019 10:42	R File	2 KB
Stat 101_Day 1_4_Plot fin.R	11/06/2019 10:42	R File	2 KB
Stat 101_Day 1_homework	11/06/2019 10:42	File	8 KB

Quick access

- Desktop
- Downloads
- Documents
- Pictures
- [48] Science Unit general
- [56] Bang epong
- ilyas
- Step by step

OneDrive

This PC

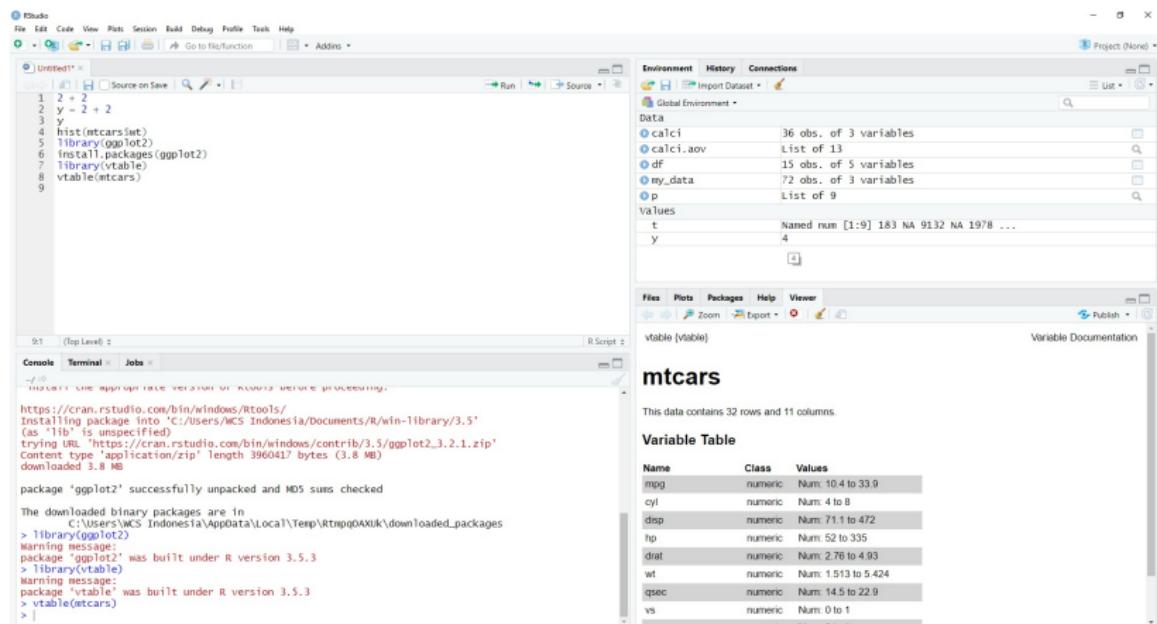
- 3D Objects
- Desktop
- Documents
- Downloads
- Music
- Pictures
- Videos

OS (C:)

DATA (D:)

Network

Second window



Setting working directory

The screenshot shows the RStudio interface with two main panes. The left pane contains an R script editor with a file named 'skip.rmd' containing R code. The right pane shows the environment and a viewer pane displaying the 'mtcars' dataset.

R Script:

```
1 setwd("D:\\[6] R starter kit\\Step by step")
2
3
4 z + z
5 y = z + z
6 y
7 library(mtcars)
8 df
9 library(ggplot2)
10 install.packages(ggplot2)
11 vtable(mtcars)
12
13
```

Environment:

Name	Class	Values
calc1	36 obs. of 3 variables	
calc1.aov	List of 13	
df	15 obs. of 5 variables	
my_data	72 obs. of 3 variables	
p	List of 9	

Values:

Name	Values
t	Named num [1:9] 183 NA 9132 NA 1978 ...
y	4

Console Output:

```
145 (Top Level) 
Console Terminal Jobs 
[1] "The downloaded binary packages are in
[1] "C:/Users/[NCs Indonesia/AppData/Local]\Temp\rtmpq0A0Uk\downloaded_packages"
> library(ggplot2)
Warning message:
package 'ggplot2' was built under R version 3.5.3
> library(vtable)
Warning message:
package 'vtable' was built under R version 3.5.3
> vtable(mtcars)
> |
```

Viewer:

mtcars

This data contains 32 rows and 11 columns.

Variable Table

Name	Class	Values
mpg	numeric	Num: 4.0 to 33.9
cyl	numeric	Num: 4 to 8
disp	numeric	Num: 71.1 to 472
hp	numeric	Num: 52 to 335
drat	numeric	Num: 2.76 to 4.93
wt	numeric	Num: 1.513 to 5.424
qsec	numeric	Num: 14.5 to 22.9
vs	numeric	Num: 0 to 1

Setting working directory

You can also check which folder you're currently working in by using the code `getwd()`. This is especially useful if you're working with several scripts where the datasets are separated in different folders.

Setting working directory

The screenshot shows the RStudio interface with the following components:

- Code Editor:** An R script named "skip.rmd" containing the following R code:

```
1 setwd("D:\\[61] R starter kit\\Step by step")
2 getwd()
3 
4 f = 2
5 y = 2 + 2
6 y
7 hist(mtcars$wt)
8 library(ggplot2)
9 install.packages(ggplot2)
10 library(vtable)
11 vtable(mtcars)
12 
13
```
- Environment Browser:** Shows the global environment with objects like calc1, calc1.aov, df, my_data, p, t, and Y.
- Viewer Pane:** Displays the "vtable" for the "mtcars" dataset, showing its structure and contents.
- Console:** Shows the output of running the R script, including the download of ggplot2 and the creation of the vtable object.

```
D:\\[61] R starter kit\\Step by step
  * installing package 'ggplot2' into C:/Users/MS Indonesia/AppData/Local/Rtmpq0AXU/k/downloaded_packages
  (as 'lib' is unspecified)
  trying URL 'https://cran.rstudio.com/bin/windows/contrib/3.5/ggplot2_3.2.1.zip'
  Content type 'application/zip' length 3960417 bytes (3.8 MB)
downloaded 3.8 MB

package 'ggplot2' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
  C:/Users/MS Indonesia/AppData/Local/Rtmpq0AXU/k/downloaded_packages
> library(ggplot2)
Warning message:
package 'ggplot2' was built under R version 3.5.3
> library(vtable)
Warning message:
package 'vtable' was built under R version 3.5.3
> vtable(mtcars)
> setwd("D:\\[61] R starter kit\\Step by step")
> getwd()
[1] "D:\\[61] R starter kit\\Step by step"
> |
```

Some notes

The dollar sign \$ is used to direct R to a certain variable within your dataset. For example, you want to see in 'mtcars' dataset, what variables are in it. You can do it by typing `names(mtcars)`

Some notes

The screenshot shows the RStudio interface with several windows open:

- Environment pane:** Shows the global environment with objects like `mtcars`, `df`, and `t`.
- Code Editor pane:** Displays a script named `skip.rmd` containing the following R code:

```
1 names(mtcars)
2 mtcars
```
- Console pane:** Shows the output of the R code entered in the editor:

```
2:1 (Top Level) 
Console Terminal R Markdown Jobs
D:\RStudio\R starter kit\Step by Step.R
> summary(df)
   X          year      day    limit      y
Min. : 1.00  Min. :1961  Min. :1.00  no :115  Min. :7.00
1st Qu.: 46.75 1st Qu.:1961  1st Qu.:123.75 yes:69   1st Qu.:15.00
Median : 92.50 Median :1962  Median :146.50 Median :20.00
Mean   : 92.50 Mean   :1962  Mean   :146.50 Mean   :21.55
3rd Qu.:138.25 3rd Qu.:1962  3rd Qu.:169.25 3rd Qu.:26.00
Max.  :184.00  Max.  :1962  Max.  :92.00  Max.  :49.00
> names(mtcars)
[1] "mpg" "cyl" "disp" "hp"   "drat" "wt"   "qsec" "vs"   "am"   "gear" "carb"
```
- Variable Table pane:** Provides a detailed view of the `mtcars` dataset, including column names, classes, and value ranges.

Some notes

Then, if you want to see a particular variable, for example, cyl variable, you can use the '\$' sign as following:

Some notes

The screenshot shows the RStudio interface with the following components:

- Script Editor:** An "Untitled" script containing the following R code:

```
1 names(mtcars)
2 mtcars$cyl
3
```
- Environment Browser:** Shows the global environment with objects like calc1, calc1.aov, df, my_data, p, t, and Y.
- Variable Viewer:** Displays the "mtcars" dataset with 32 rows and 11 columns. It includes a table of variable details and a preview of the data.
- Console:** Shows the R session history with commands like "names(mtcars)", "mtcars\$cyl", and "str(mtcars)".

Reading a file into R

There are many ways to read a file (.xls, .xlsx, .csv, .txt) into R (see details in the intro to R.pdf), but usually people use the .csv file which we will use as well here.

Reading a file into R

The screenshot shows the RStudio interface with the following components:

- Code Editor:** An R script named "skip.rmd" containing the code `df <- read.csv("Traffic.csv")`.
- Environment View:** Shows the global environment with objects like `calc1`, `df`, `my_data`, and `p`. It also displays the values for `t` and `y`.
- Console View:** Displays the R session history, including the execution of the script and a failed attempt to use variable `x` without defining it.
- Viewer View:** Shows the "mtcars" dataset with a summary message: "This data contains 32 rows and 11 columns." Below this is a "Variable Table" showing the names, classes, and ranges of the dataset's variables.

Name	Class	Values
mpg	numeric	Num: 10.4 to 33.9
cyl	numeric	Num: 4 to 8
disp	numeric	Num: 71.1 to 472
hp	numeric	Num: 52 to 335
drat	numeric	Num: 2.76 to 4.93
wt	numeric	Num: 1.513 to 5.424
qsec	numeric	Num: 14.5 to 22.9
vs	numeric	Num: 0 to 1

Reading a file into R

We're reading a file called 'Traffic.csv' and automatically assigning it into a variable named 'df'

Reading a file into R

Reading a file into R

We can run the variable 'df' to see what's in it.

Reading a file into R

The screenshot shows the RStudio interface with the following components:

- Code Editor:** An R script named "skip.rmd" is open, containing the following code:

```
1 df <- read.csv("traffic.csv")
2 df
3 summary(df)
4
```
- Console:** Displays the output of the R script:

```
158 158 1962 66 no 19
159 159 1962 67 no 24
160 160 1962 68 no 44
161 161 1962 69 no 31
162 162 1962 70 no 21
163 163 1962 70 no 20
164 164 1962 72 no 19
165 165 1962 73 no 20
166 166 1962 74 no 29
167 167 1962 75 no 48
168 168 1962 76 no 36
169 169 1962 77 no 15
170 170 1962 78 no 16
171 171 1962 79 no 29
172 172 1962 80 no 12
173 173 1962 83 yes 24
174 174 1962 83 yes 26
175 175 1962 83 yes 16
176 176 1962 84 yes 15
177 177 1962 85 yes 12
178 178 1962 86 yes 22
179 179 1962 87 yes 24
180 180 1962 88 yes 19
181 181 1962 89 yes 25
182 182 1962 90 yes 14
183 183 1962 91 yes 15
184 184 1962 92 yes 9
> summary(df)
```
- Data View:** Shows the "mtcars" dataset with 32 rows and 11 columns. The first few rows of the data frame are displayed.
- Environment View:** Lists objects in the global environment, including "df" (184 obs. of 5 variables), "my_data" (72 obs. of 3 variables), and "t" (Named num [1:9] 183 NA 9132 NA 1978 ...).
- Help:** A tooltip for the "mtcars" object is shown, stating "Variable Documentation".

Reading a file into R

And use the `summary()` command to see what's in the 'df' variable

Tasks!

- ▶ Do the following tasks, and send it over to `umardhiahsir@gmail.com` maximum by 15 November, midnight, if you want to join the upcoming R meet up. This is to ensure everybody has basic knowledge on R and we can proceed to the current theme of the meetup.
- ▶ prepare a script, give your name as a title. Example: `ulfah.R`, `budi.R`, etc.
- ▶ do the following calculations and tasks:
 - ▶ set your working directory to your preferred directory
 - ▶ sum 7 & 8
 - ▶ multiply 0.1 & 7
 - ▶ assign 7 + 6 to variable `z` and read `z`
 - ▶ read `TextPrices.csv` into variable `df2`
 - ▶ make histogram of variable `Pages` from `df2` (clue: `df2$Pages`)