

## **R Software**

**Use of a software is desirable and moreover an essential part of any analysis.**

**Some popular statistical software are SPSS, SAS, Minitab, Stata, Matlab etc.**

**Another software is R.**

**R is a free software.**

## **Developers of R Software**

**Currently developed by the R Development Core Team.**

**Available at [www.r-project.org](http://www.r-project.org)**

**It supports many free packages which helps the data scientist and analyst.**

## **What is R?**

**R is an environment for data manipulation, statistical computing, graphics display and data analysis.**

**Effective data handling and storage of outputs is possible.**

**Simple as well as complicated calculations are possible.**

**Simulations are possible.**

## **What is R?**

**Graphical display on-screen and hardcopy are possible.**

**Programming language is effective which includes all possibilities just like any other good programming language.**

**R has a statistical computing environment.**

**R is free (open source) software and therefore is not a black box.**

## **Switching to R**

**R is available for Windows, Unix, Linux and Macintosh platforms.**

**Built in and contributed packages are available, and users are provided tools to make packages.**

**It is possible to contribute own packages.**

**The commands can be saved, run and stored in script files.**

**Graphics can be directly saved in a Postscript or PDF format.**

# Installing R

You may install R in a windows or Mac platform by downloading from the Comprehensive R Archive Network (CRAN) website: [www.r-project.org](http://www.r-project.org) or directly from <http://cran.r-project.org/>

https://www.r-project.org

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## The R Project for Statistical Computing

### Getting Started

R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS.

To **download R**, please choose your preferred [CRAN mirror](#).

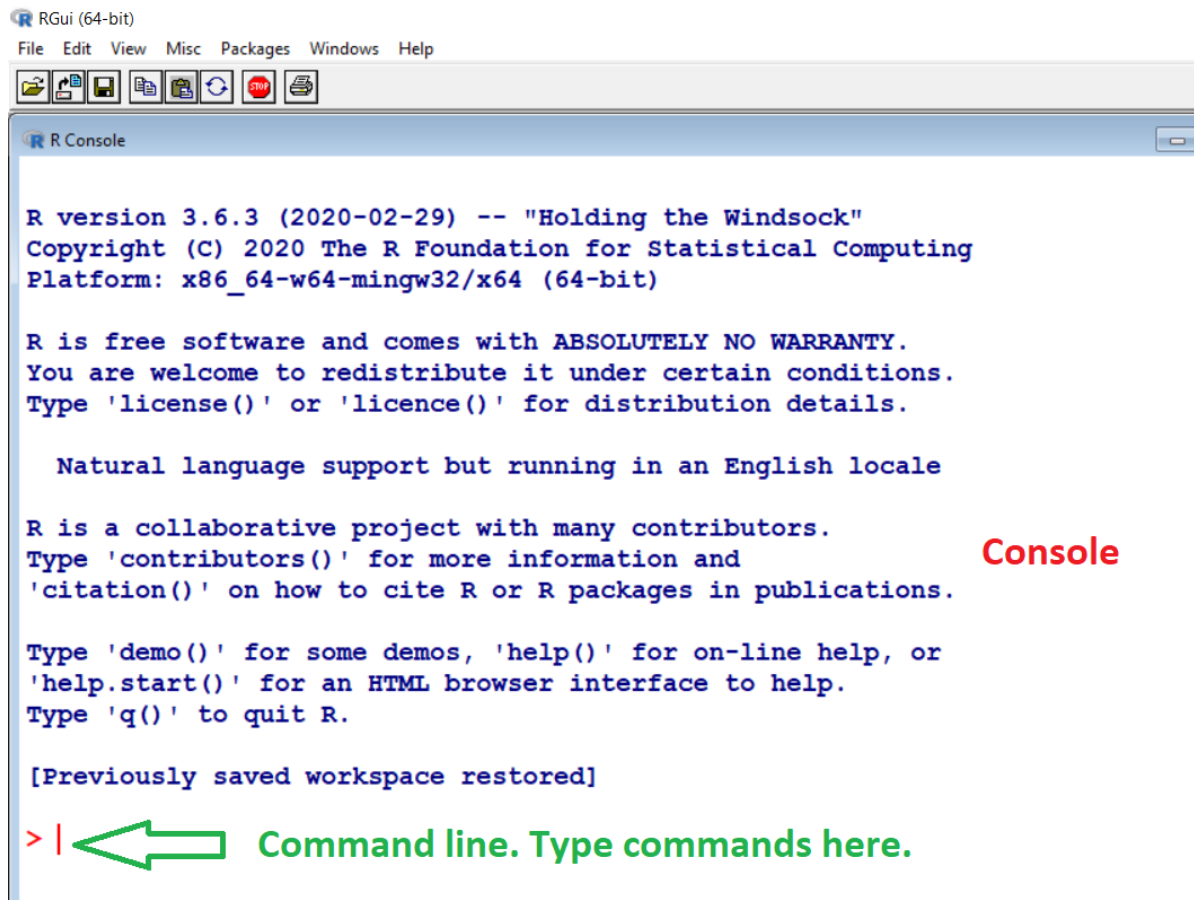
If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

# Installing R



Icon will appear.

Double click on this icon will start the software.

A screenshot of the RGui (64-bit) window. The window has a menu bar with 'File', 'Edit', 'View', 'Misc', 'Packages', 'Windows', and 'Help'. Below the menu bar is a toolbar with icons for file operations and execution. The main area is the 'R Console', which displays the following text:

```
R version 3.6.3 (2020-02-29) -- "Holding the Windsock"
Copyright (C) 2020 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.

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.

[Previously saved workspace restored]

> |
```

Console

Command line. Type commands here.

# **Installing Packages and Libraries**

**The base R package contains programs for basic operations.**

**It does not contain some of the libraries necessary for advanced statistical work.**

**Specific requirements are met by special packages.**

**They are downloaded and their downloading is very simple.**



## Installing Packages and Libraries

The base R package contains some necessary libraries only.

Other libraries are required for advanced statistical work which are downloaded and installed as and when required.

Run the R program, then use the `install.packages` command to download the libraries.

Examples :

`install.packages("ggplot2")` : installs package `ggplot2`

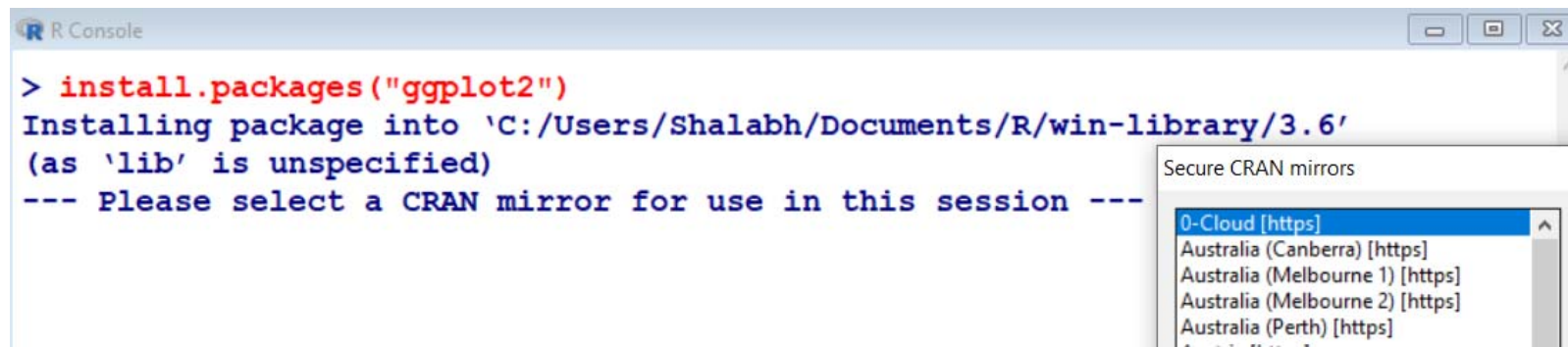
`install.packages("agricolae")` : installs package `agricolae`

`install.packages("DoE.base")` : installs package `DoE.base`

# Installing Packages and Libraries

## Example

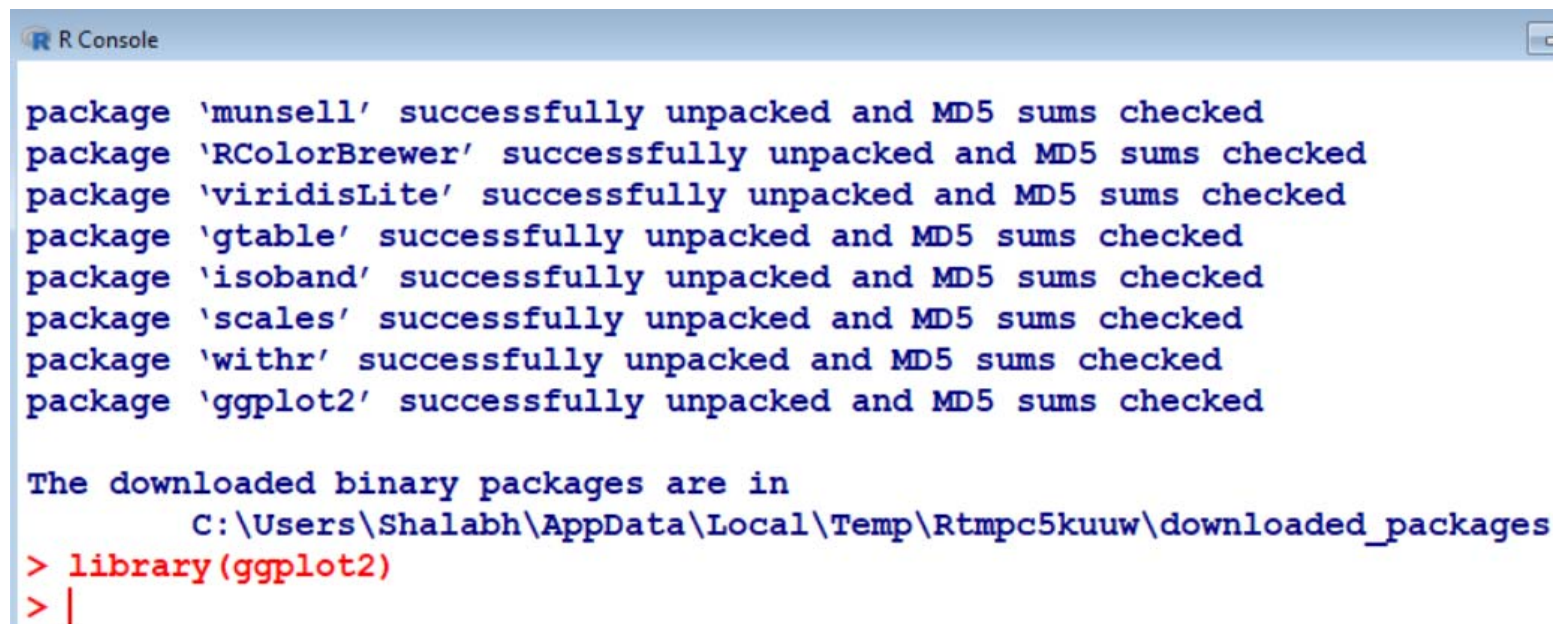
```
install.packages("ggplot2")
```



The image shows an R Console window with the following text:

```
> install.packages("ggplot2")
Installing package into 'C:/Users/Shalabh/Documents/R/win-library/3.6'
(as 'lib' is unspecified)
--- Please select a CRAN mirror for use in this session ---
```

A dialog box titled "Secure CRAN mirrors" is open, showing a list of mirrors. The first mirror, "0-Cloud [https]", is selected and highlighted in blue. Other visible mirrors include "Australia (Canberra) [https]", "Australia (Melbourne 1) [https]", "Australia (Melbourne 2) [https]", and "Australia (Perth) [https]".



The image shows an R Console window with the following text:

```
package 'munsell' successfully unpacked and MD5 sums checked
package 'RColorBrewer' successfully unpacked and MD5 sums checked
package 'viridisLite' successfully unpacked and MD5 sums checked
package 'gtable' successfully unpacked and MD5 sums checked
package 'isoband' successfully unpacked and MD5 sums checked
package 'scales' successfully unpacked and MD5 sums checked
package 'withr' successfully unpacked and MD5 sums checked
package 'ggplot2' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
      C:\Users\Shalabh\AppData\Local\Temp\Rtmpc5kuuw\downloaded_packages
> library(ggplot2)
> |
```

## Libraries in R

To use a library, type the `library` function with the name of the library in brackets.

Thus to load the `ggplot2` library type:

```
library(ggplot2)
```

Similarly,

```
library(agricolae) : loads package agricolae
```

```
library(DoE.base) : loads package DoE.base
```

## Libraries in R

Examples of libraries that come as a part of base package in R.

**MASS** : package associated with Venables and Ripley's book entitled *Modern Applied Statistics using S-Plus*.

**library(MASS)** loads package **MASS**

## Contents of Libraries

Use `help` function to get the detailed contents of library packages.

We find out about the contents of the `agricolae` library using

`library(help=agricolae)` command

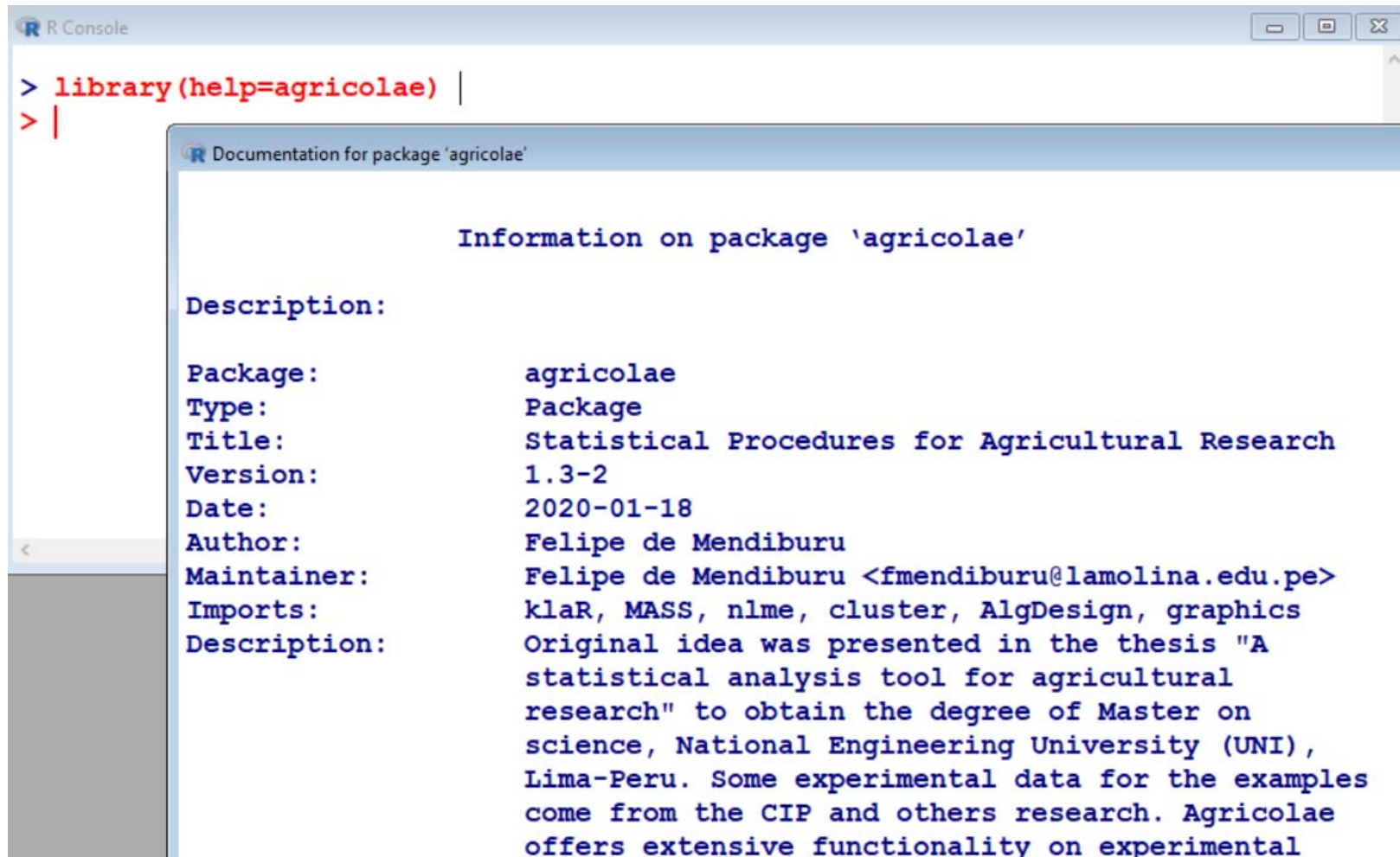
```
Information on package 'agricolae'
```

```
Description:
```

```
Package:      agricolae
Type:         Package
Title:        Statistical Procedures for Agricultural Research
Version:      1.3-2
Date:         2020-01-18
Author:       Felipe de Mendiburu
Maintainer:   Felipe de Mendiburu <fmendiburu@lamolina.edu.pe>
Imports:      klaR, MASS, nlme, cluster, AlgDesign, graphics
Description:  Original idea was presented in the thesis "A
              statistical analysis tool for agricultural ... ..
... ..
```

followed by a list of all the functions and data sets.

# Contents of Libraries



```
R Console
> library(help=agricolae)
> |
```

Documentation for package 'agricolae'

Information on package 'agricolae'

Description:

Package:	agricolae
Type:	Package
Title:	Statistical Procedures for Agricultural Research
Version:	1.3-2
Date:	2020-01-18
Author:	Felipe de Mendiburu
Maintainer:	Felipe de Mendiburu <fmendiburu@lamolina.edu.pe>
Imports:	klaR, MASS, nlme, cluster, AlgDesign, graphics
Description:	Original idea was presented in the thesis "A statistical analysis tool for agricultural research" to obtain the degree of Master on science, National Engineering University (UNI), Lima-Peru. Some experimental data for the examples come from the CIP and others research. Agricolae offers extensive functionality on experimental

## Cleaning up the Windows

We assign names to variables when analyzing any data.

It is good practice to remove the variable names given to any data frame at the end each session in R.

`rm( )` command removes variable names

For example,

`rm(x,y,z)` removes the variables `x`, `y` and `z`.

## How to clear the screen in R

Press **ctrl + L** to clear the screen of R console.

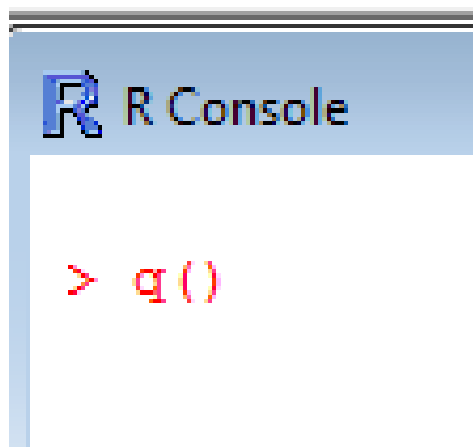


and



## How to quit in R

Type **q()** to quit R.





## Working with R

Use command line to type and execute the commands.

Some free software like R Studio, Tinn R etc. are also available to work with R software.

They are the interface between R and us and help in running the R software. Such software make coding and execution of programmes easier.

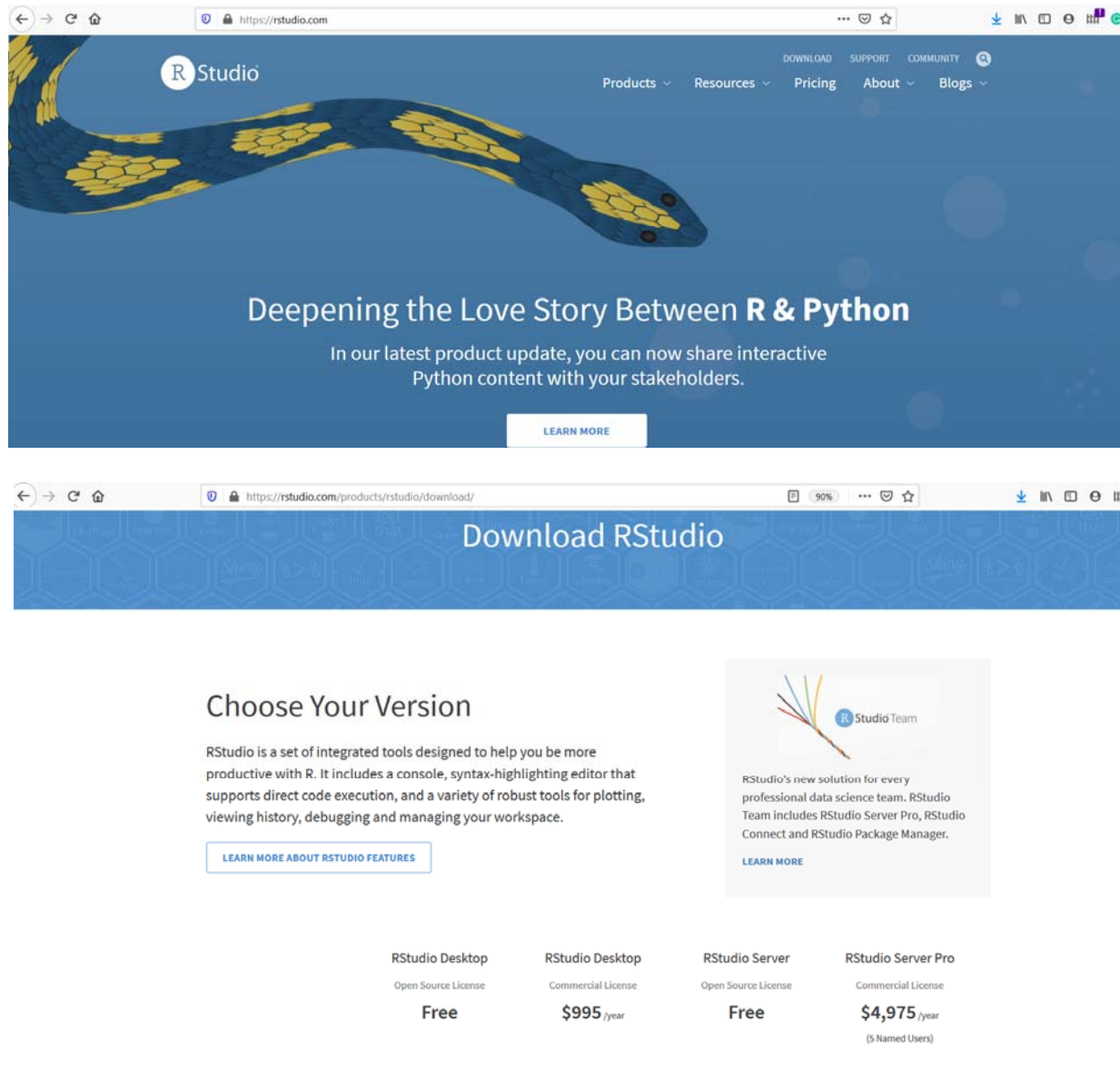
R Studio is available at <https://www.rstudio.com/>

Rstudio is written in C++ programming language.

Rstudio is a free and open-source integrated development environment (IDE) for R.

Tinn R is available at <https://sourceforge.net/projects/tinn-r/>

# Installing R Studio



The image shows two screenshots of the RStudio website. The top screenshot is the main homepage with a blue background and a yellow and black snake. The bottom screenshot is the 'Download RStudio' page, which has a blue background with a hexagonal pattern. It includes a 'Choose Your Version' section with a description of RStudio's features and a table of pricing options.

Deepening the Love Story Between **R & Python**

In our latest product update, you can now share interactive Python content with your stakeholders.

[LEARN MORE](#)

## Download RStudio

### Choose Your Version

RStudio is a set of integrated tools designed to help you be more productive with R. It includes a console, syntax-highlighting editor that supports direct code execution, and a variety of robust tools for plotting, viewing history, debugging and managing your workspace.

[LEARN MORE ABOUT RSTUDIO FEATURES](#)

RStudio's new solution for every professional data science team. RStudio Team includes RStudio Server Pro, RStudio Connect and RStudio Package Manager.

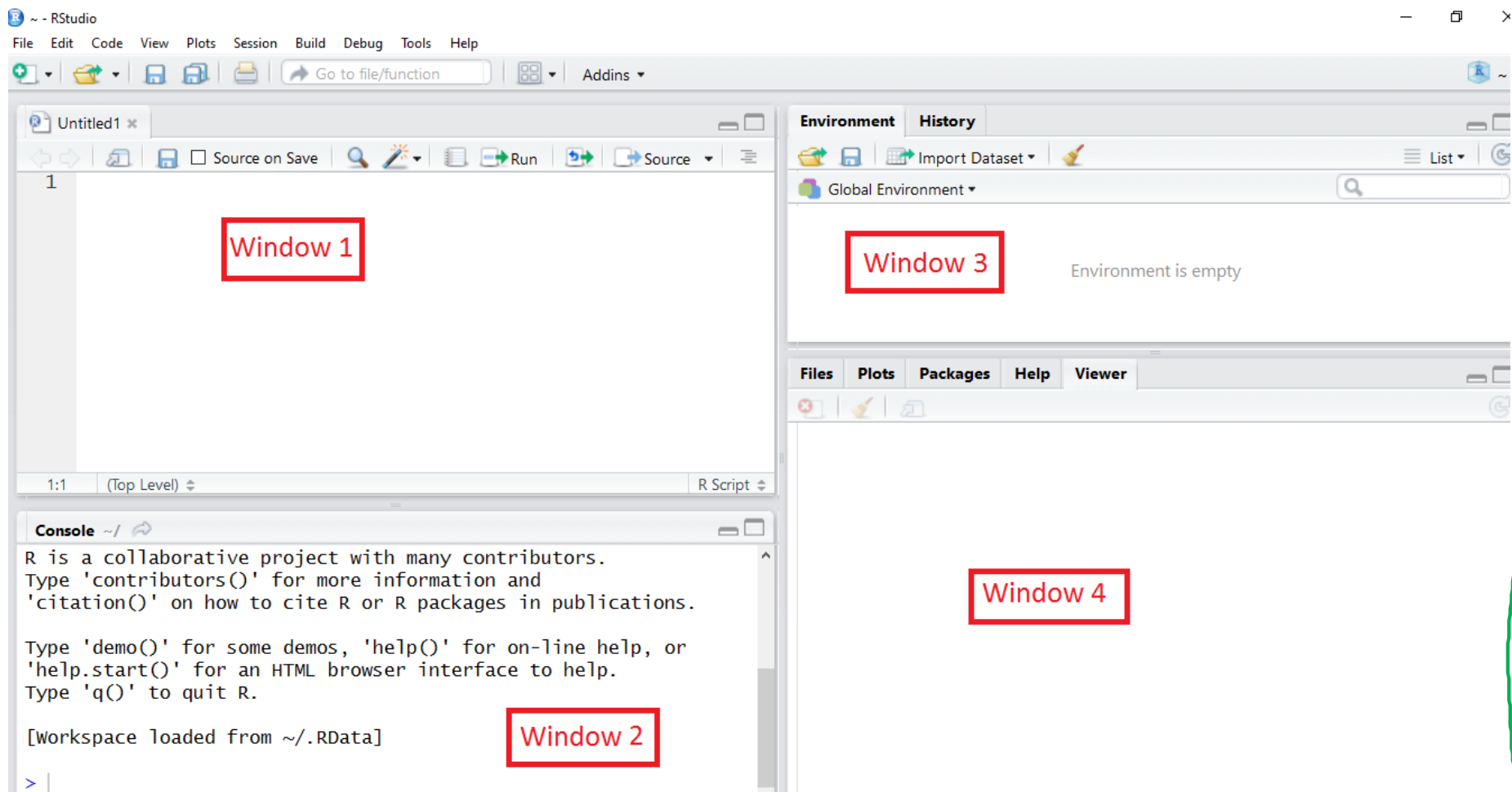
[LEARN MORE](#)

RStudio Desktop	RStudio Desktop	RStudio Server	RStudio Server Pro
Open Source License	Commercial License	Open Source License	Commercial License
Free	\$995 /year	Free	\$4,975 /year (5 Named Users)

**Download and double click on the downloaded file.**

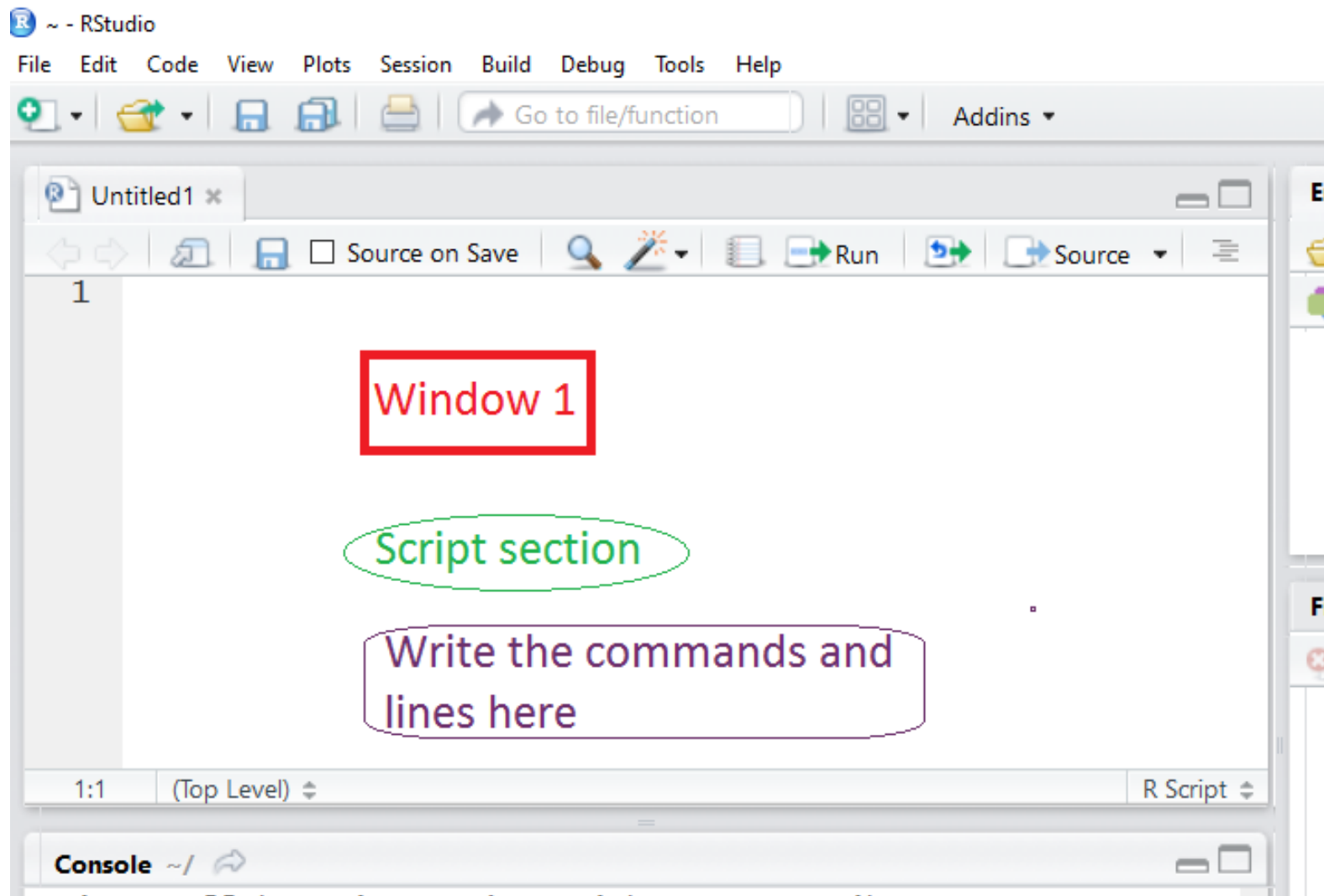
# Introduction to R Studio

First opening window of Rstudio is as follows having four windows.



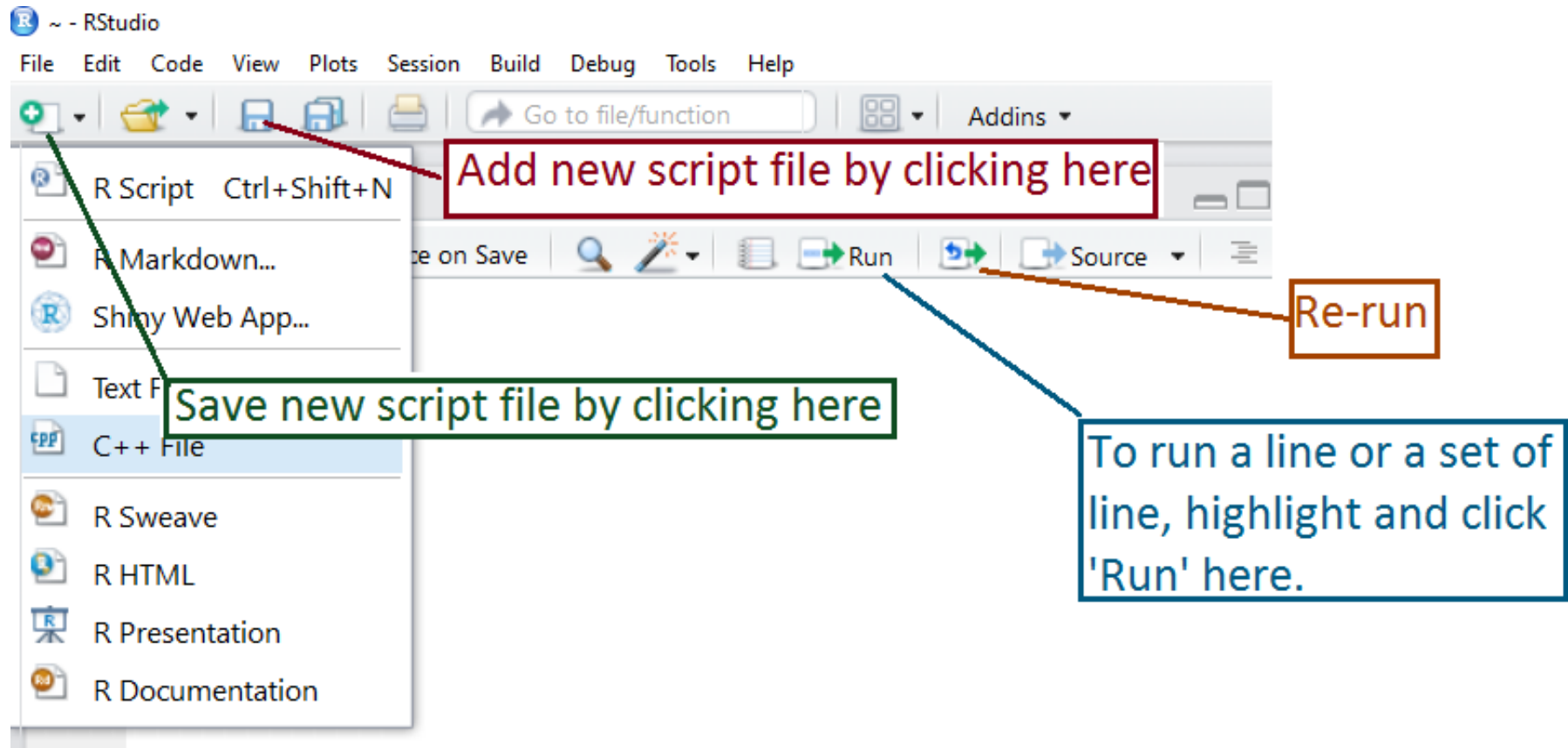
# Introduction to R Studio

## Description of Window 1



# Introduction to R Studio

## Description of Window 1



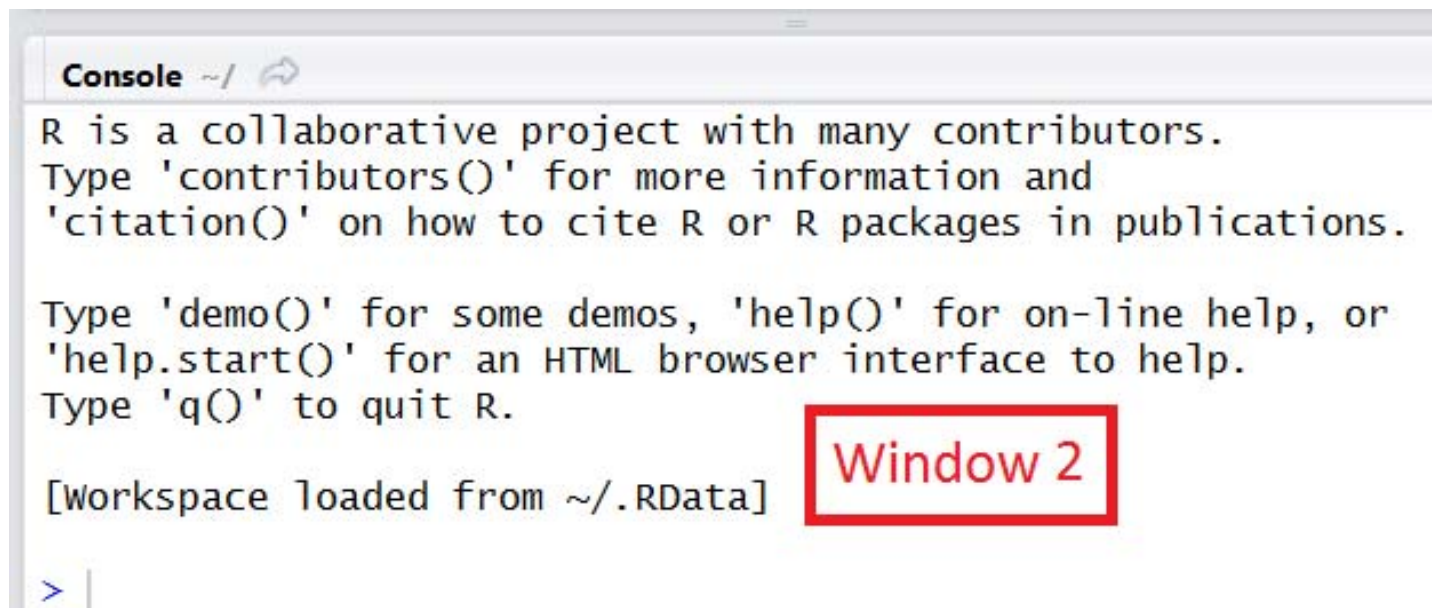
# Introduction to R Studio


## Description of Window 2 : Console

R program window appears here.

Calculations take place in console window.

One can write programmes in console also but it is hard to make corrections and experiments with the coding.



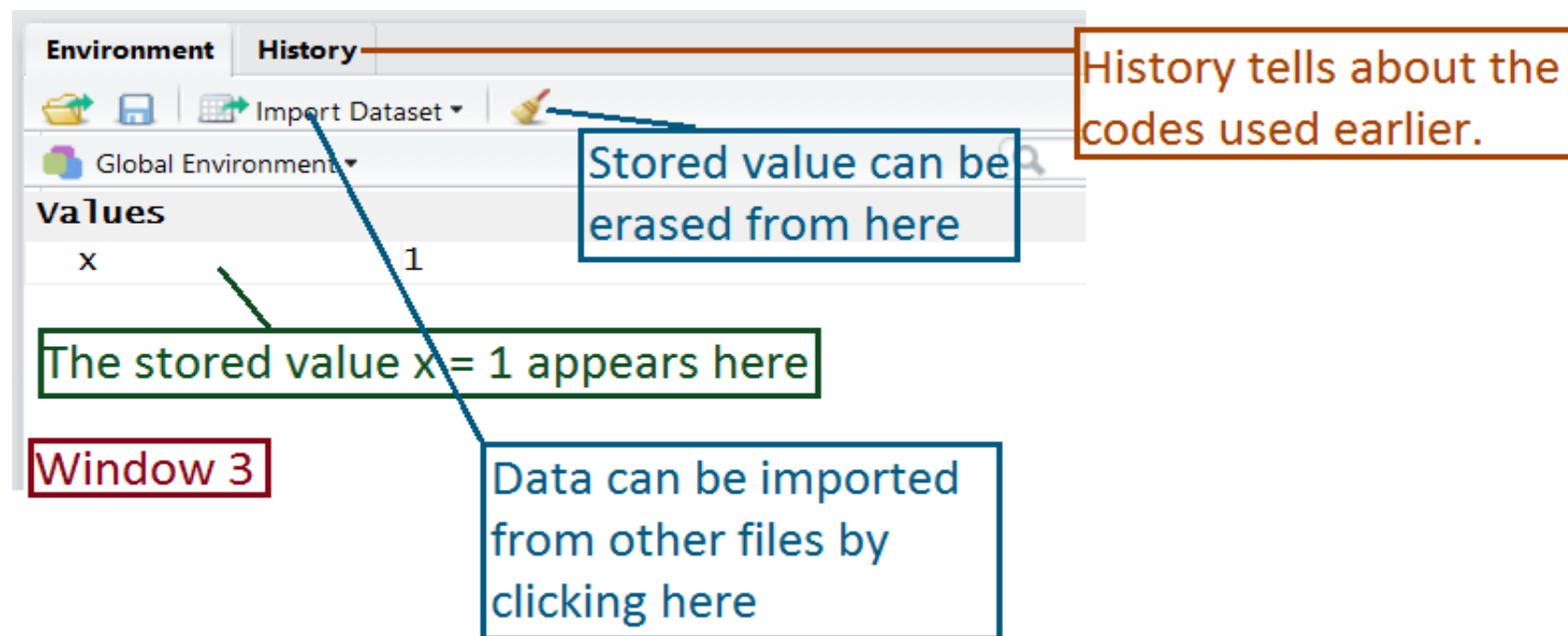
```
Console ~/   
R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.  
  
Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.  
  
[Workspace loaded from ~/.RData]  
> |
```

Window 2

# Introduction to R Studio

## Description of Window 3 : Environment window

All the variables and objects used in the programme appear here.  
The nature and values of variables and objects also appear here.



The screenshot shows the R Studio Environment window. At the top, there are tabs for 'Environment' and 'History'. Below the tabs is a toolbar with icons for file operations and a search icon. The main area is divided into two sections: 'Global Environment' and 'Values'. The 'Values' section displays a table with two columns: 'x' and '1'. A green box highlights the text 'The stored value x = 1 appears here' with a line pointing to the 'x' column. A blue box highlights the text 'Stored value can be erased from here' with a line pointing to the '1' column. A red box highlights the text 'History tells about the codes used earlier.' with a line pointing to the 'History' tab. A blue box highlights the text 'Data can be imported from other files by clicking here' with a line pointing to the 'Import Dataset' button in the toolbar. A red box highlights the text 'Window 3'.

Environment History

Import Dataset

Global Environment

Values

x 1

History tells about the codes used earlier.

Stored value can be erased from here

The stored value x = 1 appears here

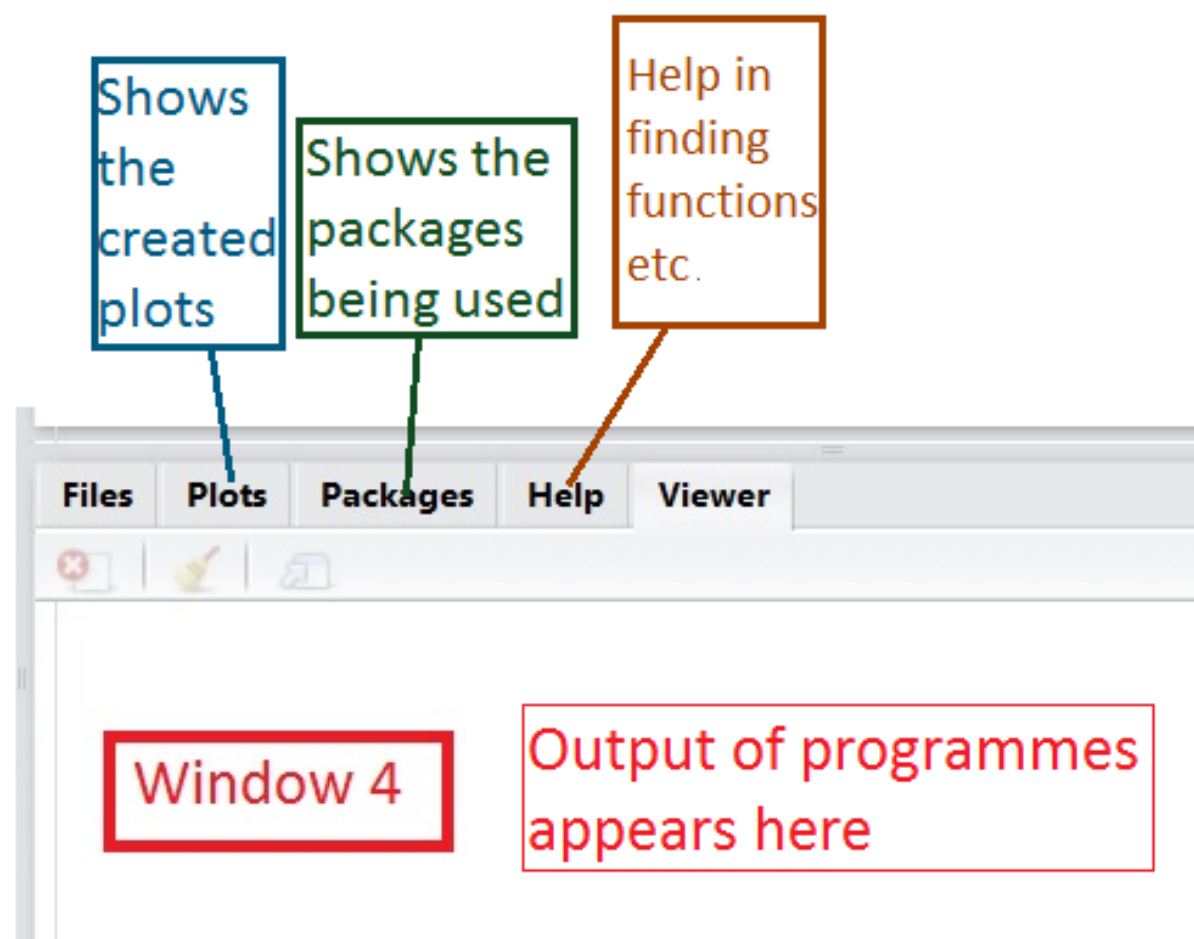
Window 3

Data can be imported from other files by clicking here

# Introduction to R Studio

## Description of Window 4 : Output window

The output of programmes appears in this window.





# Introduction to R Studio

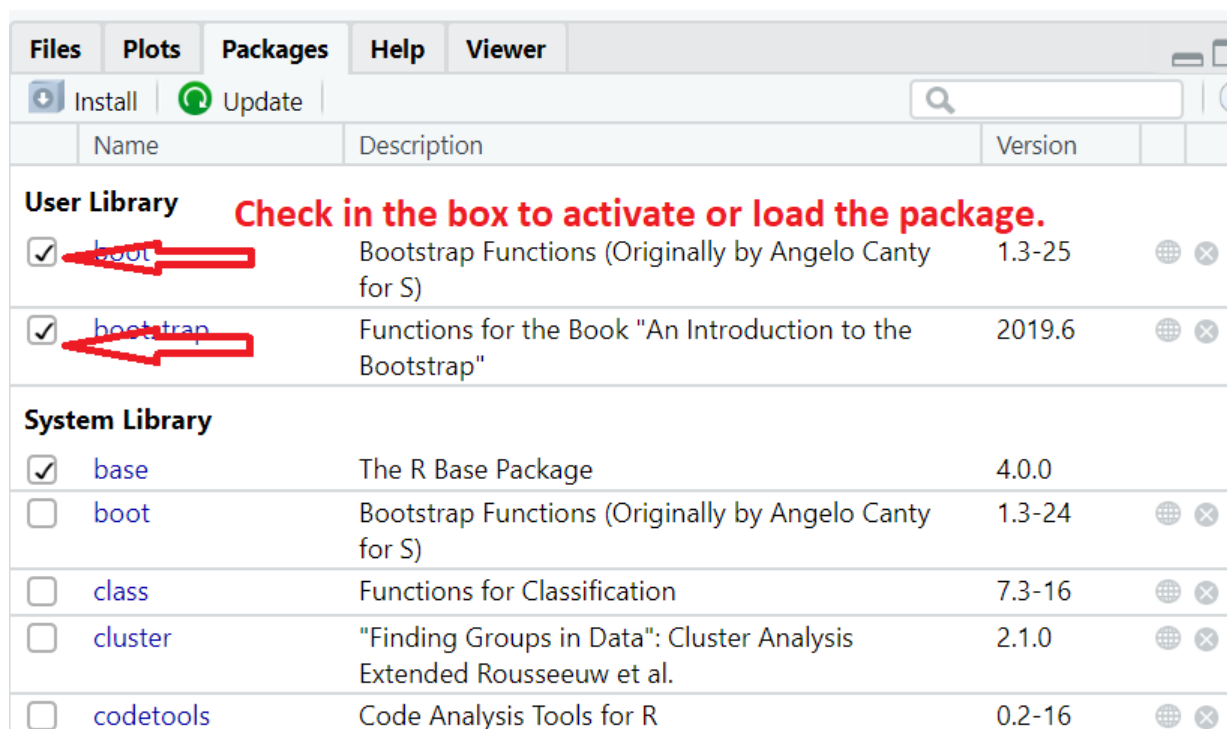
## Description of Window 4 : Output window

### Packages:

All the packages being installed appear here.

Packages are not active.

Check mark in the boxes to activate them.



# Introduction to R Studio

## Window 4 : Output window

### Help:

Various types of help can be asked.

E.g., to know about histogram,  
type **hist**.

Information appears.

