

Experiment-1

Introduction: Understanding Data types; importing/exporting data

Aim: The purpose of this experiment is to learn the input data types, various arithmetic operations of dataset and importing/exporting data in R

Procedure:

Step by step procedure to conduct the required experiment –

1. Input and creation of dataset using R
2. Perform various arithmetic operations on the dataset using R
3. Explore various types of data import using R

Introduction to R

R is an open-source programming language that is widely used as a statistical software and data analysis tool. R generally comes with the Command-line interface. R is available across widely used platforms like Windows, Linux, and macOS.

Statistical Features of R

- **Basic Statistics:** The most common basic statistics terms are the mean, mode, and median. These are all known as “Measures of Central Tendency.” So using the R language we can measure central tendency very easily.
- **Static graphics:** R is rich with facilities for creating and developing interesting static graphics. R contains functionality for many plot types including graphic maps, mosaic plots, biplots, and the list goes on.
- **Probability distributions:** Probability distributions play a vital role in statistics and by using R we can easily handle various types of probability distribution such as Binomial Distribution, Normal Distribution, Chi-squared Distribution and many more.
- **Data analysis:** It provides a large, coherent and integrated collection of tools for data analysis.
- **R Packages:** One of the major features of R is it has a wide availability of libraries. R has CRAN(Comprehensive R Archive Network), which is a repository holding more than 100000 packages.

Programming in R

Since R is much similar to other widely used languages syntactically, it is easier to code and learn in R. Programs can be written in R in any of the widely used IDE like **R Studio**, **Rattle**, **Tinn-R**, etc., After writing the program save the file with the extension **.r**. To run the program use the following command on the command line:
R file_name.r

To install R on Windows OS

- Go to the CRAN website. <https://cran.r-project.org/>
- Click on "Download R for Windows".
- Click on "install R for the first time" link to download the R executable (.exe) file.
- Run the R executable file to start installation, and allow the app to make changes to your device.
- Select the installation language.

Install RStudio

- If you want to work with R in your local machine, installing R is not enough. R does not come with a GUI-based platform. Most users install a separate IDE which allows them to interact with R. It gives them additional functionality such as help, preview, etc.
- The most popular IDE for the R programming language is **RStudio**. You can follow these steps to install RStudio on your Windows machine.
- Visit <https://www.rstudio.com/products/rstudio/download/#download> to download the free version of RStudio for any platform you want.
- Once the download is completed, you need to open the executable file to start the installation process.
- An installation wizard will appear on the screen. Click on the next button.
- On the next prompt, it will ask you to select the start menu folder for shortcut creation. Click on the install button. Once the installation is completed, click on Finish.
- You have now successfully installed RStudio in your local machine.

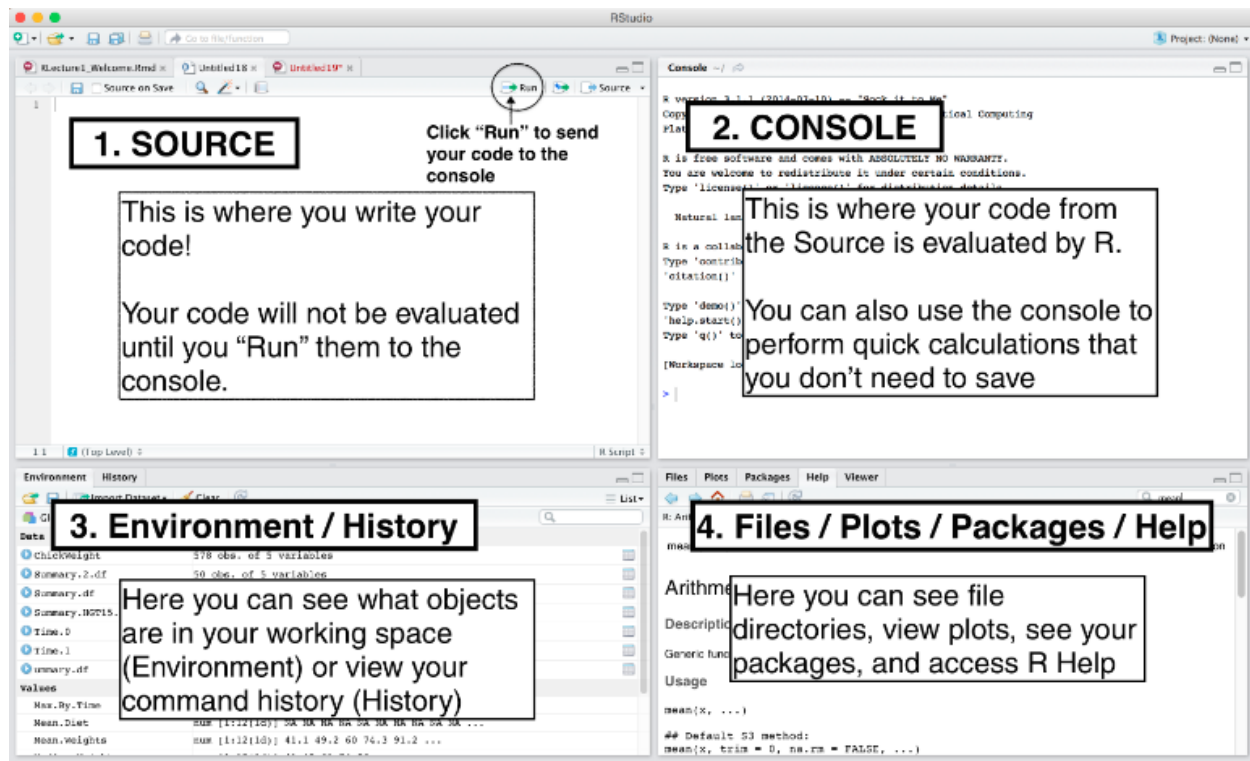
R Online Compilers

Another way to run R programs is to simply use an online environment. You don't have to go through the hassles of installing R and RStudio in this case. There are lots of competitive R compilers that you can find in a single Google search.

The most commonly used online R compilers are:

- JDoodle online R Editor
- Paiza.io online R Compiler
- IdeaOne R Compiler

The four RStudio Windows



Codes and Results

```
# Generate data
1:10

## [1] 1 2 3 4 5 6 7 8 9 10

# Assign variable name to the value
X=10; X<-10; 10->X;

# To combine numeric values into a vector
c(1,2,5)

## [1] 1 2 5

#Arithmetic operations of vectors are performed member wise.
a = c(1, 3, 5, 7)
b = c(2, 4, 6, 8)
#addition
a+b

## [1] 3 7 11 15

#subtraction
a-b
```

```
## [1] -1 -1 -1 -1

#constant multiplication
5*a

## [1] 5 15 25 35

#product
a*b

## [1] 2 12 30 56

#division
a/b

## [1] 0.5000000 0.7500000 0.8333333 0.8750000

# character object is used to represent string values in R
X=as.character(5.2)
X

## [1] "5.2"

#Concatenation of strings
paste("Baa", "Baa", "Black", "Sheep")

## [1] "Baa Baa Black Sheep"
```

Installing an R Package

- R packages provide a powerful mechanism for extending the functionality of R
- R packages can be obtained from CRAN or other repositories
- The `install.packages()` can be used to install packages at the R console
Eg. `install.packages("moments")`
- This command downloads the moments package from CRAN and installs it on your computer
- Any packages on which this package depends will also be downloaded and installed
- Multiple R packages can be installed at once with a single call to `install.packages()`
Eg. `install.packages(c("moments", "ggplot2", "devtools"))`

Loading R Packages

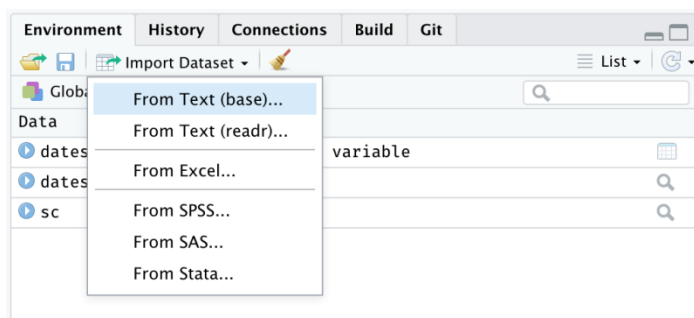
Installing a package does not make it immediately available to you in R; it must load the package.

The `library()` function loads packages that have been installed so that you may access the functionality in the package

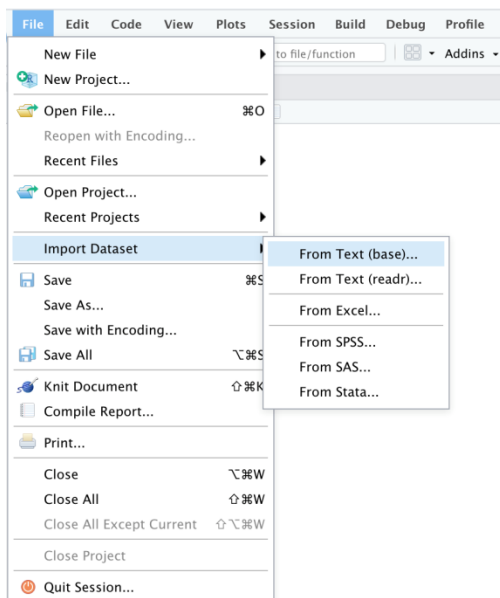
Importing Data

Importing data into R is a necessary step that, at times, can become time intensive. To ease this task, the RStudio includes new features to import data from: csv, xls, xlsx, sav, dta, por, sas and stata files.

The data import features can be accessed from the environment pane or from the tools menu. The importers are grouped into 3 categories: Text data, Excel data and statistical data. To access this feature, use the "Import Dataset" dropdown from the "Environment" pane:



Or through the "File" menu, followed by the "Import Dataset" submenu:



Importing data from Text and CSV files

Importing "From Text (readr)" files allows you to import CSV files and in general, character delimited files using the readr package. This Text importer provides support to:

- Import from the file system or a url

- Change column data types
- Skip or include-only columns
- Rename the data set
- Skip the first N rows
- Use the header row for column names
- Trim spaces in names
- Change the column delimiter
- Encoding selection
- Select quote, escape, comment and NA identifiers

Import Text Data

File/URL: Browse...

Data Preview:

Sl. No (double)	Ass-1 (double)	Ass-2 (double)
1	9	6
2	9	8
3	8	9
4	5	7
5	8	7

Previewing first 50 entries.

Import Options:

Name: ☒ First Row as Names Delimiter: Escape:

Skip: ☒ Trim Spaces Quotes: Comment:

☒ Open Data Viewer Locale: NA:

Code Preview:

```
library(readr)
Book2 <- read_csv("C:/Users/admin/Desktop/Book2.csv")
View(Book2)
```

? Reading rectangular data using readr

Import Cancel

Or `read.csv(file.choose())` can be used through R-console.

Importing data from Excel files

The Excel importer provides support to:

- Import from the file system or a url
- Change column data types
- Skip columns
- Rename the data set
- Select an specific Excel sheet
- Skip the first N rows
- Select NA identifiers

