# R Notes

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Compiled from different sources

# Basic operations

### Addition, Subtraction, Multiplication and Division

| Math | R code | Result |
|---|---|---|
| 3+2 | 3 + 2 | 5 |
| 3−2 | 3 - 2 | 1 |
| 3 x 2 | 3 * 2 | 6 |
| 3/2 | 3 / 2 | 1.5 |

**Exponents (**or use the function power)

| Math | R code | Result |
|---|---|---|
| $3^2$ | 3 ^ 2 | 9 |
| $2^{(-3)}$ | 2 ^ (-3) | 0.125 |
| $100^{1/2}$ | 100 ^ (1 / 2) | 10 |
| √100 | sqrt(100) | 10 |

### Mathematical Constants

| Math | R code | Result |
|---|---|---|
| π | pi | 3.1415927 |
| e | exp(1) | 2.7182818 |

*Source: Introduction to Econometrics with R by Florian Oswald, Jean-Marc Robin and Vincent Viers*

**Logical Operators**

| Operator | Summary | Example | Result |
|---|---|---|---|
| x < y | x less than y | 3 < 42 | TRUE |
| x > y | x greater than y | 3 > 42 | FALSE |
| x <= y | x less than or equal to y | 3 <= 42 | TRUE |
| x >= y | x greater than or equal to y | 3 >= 42 | FALSE |
| x = = y | Check if x equal to y | 3 = = 42 | FALSE |
| x != y | x not equal to y | 3 != 42 | TRUE |
| !x | not x | !(3 > 42) | TRUE |
| x \| y | x or y | (3 > 42) \| TRUE | TRUE |
| x & y | x and y | (3 < 4) & ( 42 > 13) | TRUE |

**Logarithms**

There is no ln() in R, instead it uses log() to mean the natural logarithm.

| Math | R code | Result |
|---|---|---|
| log(e)=ln(e) | log(exp(1)) | 1 |
| $\log_{10}(1000)$ | log10(1000) | 3 |
| $\log_{2}(8)$ | log2(8) | 3 |
| $\log_{4}(16)$ | log(16, base = 4) | 2 |

*Source: Introduction to Econometrics with R by Florian Oswald, Jean-Marc Robin and Vincent Viers*

## R libraries and packages

In R, a package is a collection of R functions, data and compiled code. The location where the packages are stored is called the library. If there is a particular functionality that you require, you can download the package from the appropriate site and it will be stored in your library. To actually use the package use the command "library(package)" which makes that package available to you. Then just call the appropriate package functions etc.

1. Package

Package extends basic R functionality and standardizes the distribution of code. For example, a package can contain a set of functions relating to a specific topic or tasks.

Packages can be distributed as SOURCE (a directory with all package components), BINARIES (contains files in OS-specific format) or as a BUNDLE (compressed file containing package components, similar to source).

The most basic package, for example created with,

library(devtools)

create("C:/Users/Documents/R-dev/MyPackage")

contains:

R/ directory where all the R code goes to, and DESCRIPTION and NAMESPACE metadata files.

2. Library

Library is a directory where the packages are stored. You can have multiple libraries on your hard drive.

To see which libraries are available (which paths are searched for packages):

.libPaths()

And to see which packages are there:

lapply(.libPaths(), dir)

To use package ‘x’, it first has to be installed in a package library. This can be done for example, with:

install.packages(‘x’) # to install packages from CRAN

or

R CMD INSTALL Xpackagename.tar.gz #to install directly from source

Once installed it has to be loaded into memory with library(x) or require(x).

*Source: [https://stackoverflow.com/questions/26900228/what-is-the-difference-between-a-library-and-a-package-in-r](https://stackoverflow.com/questions/26900228/what-is-the-difference-between-a-library-and-a-package-in-r)*

## Lists in R

Lists are the R objects which contain elements of different types like − numbers, strings, vectors and another list inside it. A list can also contain a matrix or a function as its elements. List is created using list() function. To create a vector from a list one can use unlist().

*Source: https://www.tutorialspoint.com/r/r_lists.htm*

List is a data structure having components of mixed data types. A vector having all elements of the same type is called atomic vector but a vector having elements of different type is called list.

*Source: https://www.datamentor.io/r-programming/list/*

## Dataframes in R

A data frame is a table or a two-dimensional array-like structure in which each column contains values of one variable and each row contains one set of values from each column.

Following are the characteristics of a data frame.

- The column names should be non-empty.
- The row names should be unique.
- The data stored in a data frame can be of numeric, factor or character type.
- Each column should contain same number of data items.

*Source: https://www.tutorialspoint.com/r/r_data_frames.htm*

A data frame is used for storing data tables. It is a list of vectors of equal length.

*Source: http://www.r-tutor.com/r-introduction/data-frame*