R Basics and Examples - A short introduction

Markus Baaske

April 30, 2018

The R Project for Statistical Computing

The R project `http://www.r-project.org` develops a free software environment for statistical computing and graphics. R compiles and runs on a wide variety of UNIX platforms, Windows and MacOS, is mostly used for statistics but can also be used as a programming (script) language alone.
R is organized as a core distribution of base packages which can be extended by further packages loaded into the a user workspace (or interpreter global environment).
Some useful links are

- Tutorials on using R can be found at `http://www.r-tutor.com/`
- Meta search and package documentation `https://www.rdocumentation.org/`
- R CRAN repository for contributed packages: `https://cran.r-project.org/`
- A short reference card `https://cran.r-project.org/doc/contrib/Short-refcard.pdf`

R Basics

```
R> PATH <- getwd()          # get working directory
R> INFO <- Sys.info()       # get system info
R> objects()                # show all loaded variables
```

```
[1] "a"    "b"    "INFO" "PATH" "x"    "XYZ"  "y"    "z"
```

```
R> ls()                     # objects in your workspace
```

```
[1] "a"    "b"    "INFO" "PATH" "x"    "XYZ"  "y"    "z"
```

Whats is in these objects?

```
R> PATH
```

```
[1] "/home/baaske/workspace/RIntro/doc"
```

```
R> INFO[c("sysname","nodename","user")]
```

```
          sysname                nodename                    user
          "Linux" "baaskelap.rdm.de"                  "baaske"
```

Important: On quitting, R offers the option of saving the workspace image, by default in the file "*.RData". Use before ending the R session:

```
R> rm(list=ls())
R> q()
```

R Help and vectors

Getting help:

```
R> help()                  # general help
R> ?length                 # help for `length`
R> help.search(lapply) # help for function `lapply`
R> help.start()            # start html help system
```

Vectors:

```
R> 2+2
[1] 4
R> round(pi,3)
[1] 3.142
R> sqrt(10)
[1] 3.162
R> 1000*(1+0.075)^5-1000
[1] 435.6
R> sin(c(30,60,90)*pi/180)
[1] 0.500 0.866 1.000
```

R variables and subsetting

```
R> a <- 2*3
R> a
[1] 6
R> a^2
[1] 36
R> b <- a^2
R> a <- c(17,1,3,9)
R> a
[1] 17  1  3  9
R> a[2]
[1] 1
R> a[c(1,3)]
[1] 17  3
R> a[-2]
[1] 17  3  9
R> a[2] <- 1
R> a
[1] 17  1  3  9
```

Characters and categories

```
R> (x <- "Hallo")                          # character vector
[1] "Hallo"
R> (y <- factor(c("C","A","C","B")))       # characters as categories
[1] C A C B
Levels: A B C
R> (z <- factor(c(1,1,2)))                 # numbers as factors
[1] 1 1 2
Levels: 1 2
R> (x <- c(1,2,3))                         # distroy x and overwrite
[1] 1 2 3
R> x[4]                                    # NA = Not Available
[1] NA
R> try(x[4])                               # catch error
[1] NA
```

R object classes

```
R> class(1.7) # "numeric"
[1] "numeric"
R> class(x)   # "character" = character vector
[1] "numeric"
R> class(y)   # "factor" categories
[1] "factor"
R> class(z)
[1] "factor"
R> mode(1.7)
[1] "numeric"
R> x <- as.integer(x)
R> class(x)
[1] "integer"
R> z <- as.character(z)
R> class(z)
[1] "character"
```

Characters and categories

```
R> # Save contents of workspace, into the file .RData
R> save.image()
R> # Save into the file archive.RData
R> save.image(file="archive.RData")
R> # save single objects
R> save(x, y,z, file="tmpobj.RData")
R> # save as RDS (could be big data)
R> saveRDS(list(x,y,z),file="myfile.rds")
R> # read as RDS
R> XYZ <- readRDS(file="myfile.rds")

R> # attach (reload) to current workspace
R> attach("tmpobj.RData")
R> ls()

[1] "a"    "b"    "INFO" "PATH" "x"    "XYZ"  "y"    "z"
```