Parentheses are for functions, brackets are for indicating the position of items in a vector or matrix. (Here, items with numbers like \(x_1\) are user-supplied variables.)

**Miscellaneous**

- `q()`: quit
- `<-`: assign
- `INSTALL package1`: install package1
- `m1[,2]`: column 2 of matrix \(m_1\)
- `m1[,2:5]` or `m1[,c(2,3,4,5)]`: columns 2–5
- `m1$a1`: variable \(a1\) in data frame \(m1\)
- `NA`: missing data
- `is.na`: true if data missing
- `library(mva)`: load (e.g.) the \(mva\) package
- `help(command1)`: get help with \(command1\)
- `help.start()`: start browser help
- `help(package=mva)`: help with (e.g.) package \(mva\)
- `apropos("topic1")` and `help.search("topic1")`: commands relevant to \(topic1\)
- `example(command1)`: examples of \(command1\)

**Input and output**

- `source("file1")`: run the commands in \(file1\).
- `read.table("file1")`: read in data from \(file1\)
- `data.entry()`: spreadsheet
- `scan(x1)`: read a vector \(x1\)
- `download.file("url1")`: from internet
- `url.show("url1")`, `read.table.url("url1")`: remote input
- `sink("file1")`: output to \(file1\), until `sink()`
- `write(object1,"file1")`: writes \(object1\) to \(file1\)
- `write.table(dataframe1,"file1")`: writes a table

**Managing variables and objects**

- `attach(x1)`
- `detach(x1)`
- `ls()`: lists all the active objects.
- `str(object1)`: print useful information about \(object1\)
- `rm(object1)`: remove \(object1\)
- `dim(matrix1)`: dimensions of `matrix1`
- `dimnames(x1)`: names of dimensions of \(x1\)
- `length(vector1)`: length of \(vector1\)
- `1:3`: the vector 1,2,3
- `c(1,2,3)`: creates the same vector
- `rep(x1,n1)`: repeats the vector \(x1\) \(n1\) times
- `cbind(a1,b1,c1)`, `rbind(a1,b1,c1)`: binds columns or rows into a matrix
- `merge(df1,df2)`: merge data frames
- `matrix(vector1,r1,c1)`: make `vector1` into a matrix with \(r1\) rows and \(c1\) columns
- `data.frame(v1,v2)`: make a data frame from vectors \(v1\) and \(v2\)
- `as.factor()`, `as.matrix()`, `as.vector()`: conversion
- `is.factor()`, `is.matrix()`, `is.vector()`: what it is
- `t()`: switch rows and columns
- `which(x1==a1)`: returns indices of \(x1\) where \(x1==a1\)

**Control flow**

- `for (i1 in vector1)`: repeat what follows
- `if (condition1) ... else ...`: conditional

**Arithmetic**

- `\%\%`: matrix multiplication
- `\%/\%, \^, \%\%, \sqrt()`: integer division, power, modulus, square root

**Statistics**

- `max()`, `min()`, `mean()`, `median()`, `sum()`, `var()`: as named
- `summary(data.frame)`: prints statistics
- `rank()`, `sort()`: rank and sort
- `ave(x1,y1)`: averages of \(x1\) grouped by factor \(y1\)
- `by()`: apply function to data frame by factor
- `apply(x1,n1,function1)`: apply function1 (e.g. `mean`) to \(x\) by rows (\(n1=1\)) or columns (\(n2=2\))
- `tapply(x1,list1,function1)`: apply function to \(x1\) by \(list1\)
- `table()`: make a table
- `tabulate()`: tabulate a vector

**basic statistical analysis**

- `aov()`, `anova()`, `lm()`, `glm()`: (generalized) linear models, anova
- `t.test()`: t test
- `prop.test()`, `binom.test()`: sign test
- `chisq.test(x1)`: chi-square test on matrix \(x1\)
- `fisher.test()`: Fisher exact test
- `cor(a)`: show correlations
- `cor.test(a,b)`: test correlation
- `friedman.test()`: Friedman test

**some statistics in \(mva\) package**

- `prcomp()`: principal components
- `kmeans()`: kmeans cluster analysis
- `factanal()`: factor analysis
- `cancor()`: canonical correlation

**Graphics**

- `plot()`, `barplot()`, `boxplot()`, `stem()`, `hist()`: basic plots
- `matplot()`: matrix plot
- `pairs(matrix)`: scatterplots
- `cplot()`: conditional plot
- `stripplot()`: strip plot
- `qqplot()`: quantile-quantile plot
- `qqnorm()`, `qqline()`: fit normal distribution