Questions and answers

Matrices, lists and data frames

1. Questions and answers

2. Matrices, lists and data frames
   - Matrices
   - Lists
   - Data frames (tables)
Outline

1. Questions and answers

2. Matrices, lists and data frames
   - Matrices
   - Lists
   - Data frames (tables)
> setwd("<working folder>")

or

“Change dir”

in menu!
What is a difference between factor and character vector in R?
What is a difference between factor and character vector in R?

- Factor virtually contains both numbers and text
- One may apply both `as.numeric()` and `as.character()` to factor
Matrices, lists and data frames

Matrices
Matrices are vectors

- In R, numeric tables (matrices) are simply vectors with two dimensions.
- It is also possible to create multidimensional arrays.
Matrix and vector

> m <- 1:4
> ma <- matrix(m, ncol=2, byrow=TRUE)
> str(ma)
> str(m)
> mb <- m
> dim(mb) <- c(2,2)
> mb

The structure of objects \texttt{m} and \texttt{ma} are not significantly different, only screen output is not similar (try it!). Function \texttt{dim()} will add dimensions to vector transforming it into matrix or array.
Three-dimensional matrix (array)

```r
> m3 <- 1:8
> dim(m3) <- c(2,2,2)
> m3
```
Matrices, lists and data frames

Lists
List is a collection of everything

- List may contain any type of objects
- Moreover, list can contain other lists, and so on
List examples

```r
> l <- list("R", 1:3, TRUE, NA, list("r", 4))
> l
> str(l)
> fred <- (name="Fred", wife="Mary", no.children=3,
+ child.ages=c(5,9))
> fred
```
Indexing of vectors, matrices and lists

> m[3] # third element of vector m
> ma[2, 1] # second row, first column
> l[1] # lists may be indexed like vectors
> str(l[1]) # it’s a list!
> l[[1]] # not the same as l[1]!
> str(l[[1]]) # it’s a vector!
In R, elements of vectors and lists, columns and rows of matrices may have *names*:

```r
> names(fred)
> fred$wife # this is a selection by name
> w <- 60:66
> names(w) <- c("Rick", "Amanda", "Peter", "Alex", + "Kathy", "Ben", "George")
> w
> w["Rick"]
> rownames(ma) <- c("a1", "a2")
> colnames(ma) <- c("b1", "b2")
> ma
```
Matrices, lists and data frames

Data frames (tables)
This is a most important type of object; most of data are represented by data frames. 

*Date frame is a list of vectors of same length*
How to create a data frame

```r
> x <- 171:177
> sex.f <- c("m","m","f","f","f","m","f")
> m.o <- c("L","XL","S","M","S","M","XL")
> d <- data.frame(weight=w, height=x, size=m.o, sex=sex.f)
> d
> str(d)
```
Selection from data frames

> d$weight # by name
> d[[1]] # by number, as list
> d[,1] # by number of column, as matrix
> d[,"weight"] # by name of column
> d[,2:4] # columns 2, 3, 4
> d[,-1] # all columns except first
> d[-1,] # all rows except first
Selection by condition

> d[d$sex=="f",]  # will select only women
> d[d$sex!="f",]  # will select all other genders ;)

== is “equal?”,
& “and”,
| “or” and
! is “not”
Sorting and ordering

> sort(x) # ascending
> rev(sort(x)) # descending
> d[order(d$sex, d$height), ] # sort by sex then by height
> savehistory("20120215.r")
Final question (2 points)

How to select from data frame \texttt{eq} column which name is \texttt{NUM.Z}?
Final question (2 points)

How to select from data frame `eq` column which name is `NUM.Z`?
Summary: most important commands

- `[`—selects an element, row or column
- `$`—selects by name from list or data frame
For Further Reading

A. Shipunov.  
*Biometry* [Electronic resource].  
2012—onwards.  
Mode of access: [http://ashipunov.info/shipunov/school/biol_299](http://ashipunov.info/shipunov/school/biol_299)

P. Dalgaard  
Chapter 1.2.