

# Biometry. Lecture 10

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February 15, 2012

# Outline

- 1 Questions and answers
- 2 Matrices, lists and data frames
  - Matrices
  - Lists
  - Data frames (tables)

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# Starting...

```
> setwd("<working folder>")
```

or

“Change dir”  
in menu!

## Previous final question: the answer

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

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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 `m` and `ma` are not significantly different, only screen output is not similar (try it!). Function `dim()` will add dimensions to vector transforming it into matrix or array.

# Three-dimensional matrix (array)

```
> 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

```
> 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!
```

# Names

In R, elements of vectors and lists, columns and rows of matrices may have *names*:

```
> 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)

# More important than any other object

- 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

```
> 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
```

# Finishing...

```
> savehistory("20120215.r")
```

# Final question (2 points)

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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`



P. Dalgaard

*Introductory Statistics with R*. 2nd edition.

Springer, 2008.

*Chapter 1.2.*