Data Programming Exam

Please reply to the following questions in an R script called "surname_name.R" (e.g., Mario Rossi will return a file named "rossi_mario.R") and send it by mail to andrea.spano@quantide.com

Please comment your answers using the symbol: #, before the comments (e.g., # my comment).

Exercise 1

a. Create a vector, named `vec`, containing the following values:
   1, 5, 12, 14, 6, 78, 68, 34, 34, 32, 56, 75

b. Select the 3-rd element of `vec`.

c. Select all elements of `vec` apart from the 1st.

Exercise 2

a. Generate a matrix, named `mat`, with 3 rows and 5 columns containig numbers from 1 to 15.

b. Select 2-nd and 3-rd rows and 1-st and 3-rd columns of `mat`.

Exercise 3

Given the following list, named `this_list`:

```
this_list <- list(numbers = c(2,3,5,6,7), letters = c("z", "x", "y", "t"))
this_list
```

```
## $numbers
## [1] 2 3 5 6 7
##
## $letters
## [1] "z" "x" "y" "t"
```

a. Extract the element named `letters` of `this_list` by using the `$` operator.

b. Extract the first element of `this_list` by using double square brackets.

Exercise 4

a. Generate a data frame, named `df`, corresponding to:

```
  country population continent
    Italy   59801004    Europe
   France   64668129    Europe
    China 1382323332      Asia
    Japan  126323715      Asia
    Libya    6330159    Africa
 Cameroon   23924407    Africa
```

Use `data.frame()` function and remember to maintain character vectors as they are, specifiyng `stringsAsFactors = FALSE`.

b. Convert `continent` variable of `df` as a factor with levels: "Europe", "Asia" and "Africa". Use `factor()` function.

Exercise 5

a. Import the file *2008.csv* into a data frame named `flights` by using the `read.table()` command. Remember to specify `stringsAsFactors` as `FALSE` in order to avoid importing character columns as factors.
Before importing be sure about:

- column names in the first row
- the field separator
- the decimal separator

This dataset contains information about flight arrival and departure details for all commercial flights within the USA in 2008.

Load `dplyr` library:

```
require(dplyr)
```

b. Convert `flights` data frame to a `tbl_df` using `tbl_df()` function.

c. Starting from `flights` data frame, select `ArrDelay` and `Dest` variables and filter the records for which `ArrDelay` variable is greater than 120.

d. Starting from `flights` data frame, compute the mean delay at departure (`DepDelay` variable) grouping by `Origin` variable. Remember to add `na.rm=TRUE option` to mean computation.

Exercise 6

Load `mtcars` dataset in this way:

```
data("mtcars")
```

`mtcars` data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973–74 models).

```
head(mtcars)
```

```
##                   mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
## Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

To achieve more information about `mtcars` dataset type `?mtcars` on R console.

Load `ggplot2` library:

```
require(ggplot2)
```

a. Calculate the number of rows and columns of the `mtcars` dataset.

b. Build a scatterplot to analyze the relationship between `mpg` and `wt` variables. Use `ggplot()` and `geom_point()` functions.

c. Represent the distribution of `mpg` variable with an histogram. Use `ggplot()` and `geom_histogram()` functions.