# PROGRAMMING FOR COGNITIVE SCIENCE

Laboratory 1: **R basics**

## Tasks:

### Task 1.

Create variables containing a string (character), an integer, and a real number. The string should be named "string" and contain the word "hello". The real number should be called "real" and its value should be 10. The "integer" variable should contain 20.

For each of the created variables, check the results of the following functions: `is.numeric()`, `as.numeric()`, `is.integer()`, `as.integer()`, `is.character()`, `as.character()`, `typeof()`, `class()`.

### Task 2.

Write R code which calculates the results of the following formulas for the chosen value of x:

a) $y = 2\sqrt{x+3}$
b) $y = \frac{1}{x^2+x-6}$
c) $y = 3 - |x|$

### Task 3.

a) Write the function which takes two parameters (a and b) and returns their ratio.
b) Run this function for various values of a and b. What happens when b=0?
c) Modify the function, so that it only calculates the ratio when b≠0 and prints the information about wrong parameter otherwise.

### Task 4.

Write a loop which prints values from 0 to 50 with the step equal to 5. Then, modify this function so that it does not print even numbers.

### Task 5.

Write a code which calculates the product of all elements in a given numeric vector, expect for the elements equal to 0.

### Task 6.

Load the `Auto` dataset from the `ISLR` package.

a) Use the help section to find out about the variables in this dataset.
b) Check the dimensions of the data frame (number of rows and columns).

c) Print the names of the columns.
d) Investigate the structure of the dataset with the `str()` function. Which of the variables are quantitative, and which are qualitative?
e) Print the summary of all variables.
f) What is the organization of the data sets? What do columns and rows correspond to (observations, variables)?
g) Extract the quantitative variables and store them as new data frame.
h) In a loop, calculate the mean and standard deviation of each quantitative variable. Print the results in each iteration.
i) Write the function which returns the range of an input vector.
j) Apply the function from the previous point to each quantitative variable.
k) Now remove the $10^{th}$ through $85^{th}$ observations. What is the range, mean, and standard deviation of each variable in the subset of the data that remains?

## Task 7.

Load the `Credit` dataset from the `ISLR` package.

a) Use the help section to find out about the variables in this dataset.
b) Investigate the structure of the dataset with the `str()` function. Which of the variables are quantitative, and which are qualitative?
c) Write a function that takes a vector as an input and returns "identical" if all elements are identical to the names of rows of the `Credit` data frame, and "different" otherwise.
d) With the use of a loop, apply your function to each column in `Credit` data frame.
e) Change the type of the first column into a character vector.
f) Repeat point (c).
g) Remove the column containing entries identical to the names of the rows.