Introduction to Econometrics
Session 3 – Vectors and Lists in R

October 2025

1 Exercise 1

Create a vector corresponding to the natural integers from 1 to 100, in ascending order.

2 Exercise 2

Create a vector with 100 repetitions of the numbers from 1 to 10, followed by 20 repetitions of the number 1.

3 Exercise 3

The function `sum` applied to a vector gives the sum of all its elements. Create a vector of length 100 that contains all the natural integers from 1 to 100 and compute its sum. Verify with `R` in this case the equality:

$$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$

4 Exercise 4

Construct a vector that contains all the integers from 1 to 100 in descending order.

5 Exercise 5

Create a vector corresponding to the natural integers from 1 to 100, in ascending order. From this vector, construct a vector corresponding to the natural integers from 1 to 100 in descending order.

6 Exercise 6

Construct a vector that contains the first 100 elements of the real sequence defined by:

$$u_1 = 3 \text{ and } \forall n \in N^* \; u_{n+1} = 0.3u_n + 5$$

Check with `R` that these elements are all less than 8.

7 Exercise 7

The Fibonacci sequence is defined by:

$$u_0 = 0, u_1 = 1 \text{ and } \forall n \in N \; u_n + u_{n+1} = u_{n+2}$$

Construct a vector that contains the first 50 elements of the sequence.

8 Exercise 8

Create a vector of length 100 that simulates 100 rolls of a six-sided die. Compute the empirical mean and standard deviation of the outcomes.

9 Exercise 9

Create a list containing three elements: a vector of integers from 1 to 10, a character string (for example `"Hello R"`), and the boolean value `TRUE`. Display the content of the list. Name these elements: `"vector"`, `"string"` and `"boolean"`.

10 Exercise 10

Create a list containing two elements:

- a numeric vector `c(2, 4, 6, 8)`
- a character vector `c("a", "b", "c")`

Access separately the first element of the list, then the second element, and then the second element of the character vector.

11 Exercise 11

Create a list containing three numeric vectors of different lengths. Compute the length of each element of the list using the function `length()`.

12 Exercise 12

Create a list containing a vector of numbers from 1 to 5 and a vector of their squares.

13 Problem

14 Problem

1. Simulate repeated experiments of rolling a six-sided die:
    - Create a list that contains 10,000 vectors, each corresponding to 10 rolls of a fair die.
    - Create another list that contains 10,000 vectors, each corresponding to 10,000 rolls of a fair die.
2. Write a function that takes a numeric vector as input and returns a list with its mean and empirical standard deviation. The elements of the list must be named `"mean"` and `"std"`.
3. Apply this function to each simulated sample in the two lists, and collect the results.
4. Extract the means from each set of results into two separate vectors.
5. Plot the density of these vectors using the package `ggplot`. How does the distribution of the sample means evolve as the sample size increases? Which theoretical results in probability does this illustrate?