# Exercise

## (week 6)

### Submit by 1 May 2023

**Instructions: Submit your exercise in both PDF and RMD formats, including the R code for the questions when relevant.**

## Question 1

If you select 2 random integers between 1 and 10 without replacement, what is the probability that the second integer is larger than the first? Write the R code that calculates the probability through a Monte Carlo simulation of 100 runs. Also calculate the exact probability.

## Question 2

If you select a random integer between 1 and 100, what is the probability that it is divisible by either 2 or 3? Calculate the exact probability using the inclusion-exclusion principle and write a Monte Carlo simulation that provides an approximation to the probability.

## Question 3

If you roll two fair six-sided dice, what is the probability that the sum of the two numbers is 7? Write the exact probability and provide a Monte Carlo simulation that approximates the probability.

## Question 4

Define the following events for a random experiment where a fair coin with four black wigs and two white wigs is tossed twice:

A = In the first toss, a white wig was obtained

B = In the first and second toss, wigs of different colors were obtained.

Are A and B dependent? Provide reasoning to support your answer.

## Question 5

A group of people are interviewed for a position in a desirable company. Among the candidates, 40% are Spanish speakers, and 60% of the Spanish speakers have an academic degree. It is known that half of the academic degree holders are Spanish speakers.

- a. What is the probability of a random candidate having an academic degree?
- b. Are the events "a candidate with an academic degree" and "a Spanish-speaking candidate" dependent or not? Explain.
- c. The company invites for a second interview only the candidates who speak Spanish or have an academic degree. What percentage of the candidates will be invited for a second interview?

## Question 6

A pair of dices are thrown over and over again until you get a sum of 10 or a sum of 8 or a sum of 3 and then you stop. What is the probability that the game stops and on the last throw you got a sum of 10? (Calculate the exact probability and a Monte Carlo simulation that approximates the probability.)

# Good luck !